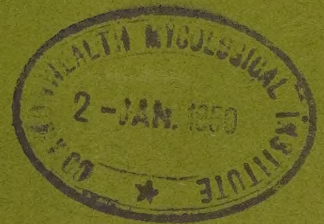




ZANZIBAR PROTECTORATE

Annual Report
OF THE
Department of Agriculture
1948

[PRICE: SHS. 2]



DEPARTMENT OF AGRICULTURE—PROTECTORATE STAFF

<i>Director</i> ...	...	O. S. SWAINSON, B.A. (Cantab.).
<i>Senior Agricultural Officer</i> ...	...	A. K. BRIANT, M.A. (Cantab.), Dip. Agric., A.I.C.T.A. (Trinidad).
<i>Agricultural Officers</i> ...	...	F. B. WILSON, M.B.E., M.A. (Cantab.), Dip. Agric., A.I.C.T.A. (Trinidad). (Transferred to Kenya on 5th February, 1948.)
		G. E. TIDBURY, B.Sc. (Hons.) (Lond.), A.R.C.S., A.I.C.T.A. (Trinidad).
		G. W. ANDERSON, B.Sc. (Agric.), (Hons.) (Zool.) (Edin.), A.I.C.T.A. (Trinidad). (Transferred from Kenya on 1st March, 1948.)
		D. W. WINTER, B.Sc. (St. Andrews), A.I.C.T.A. (Trinidad).
<i>Agricultural Development Officer (Temporary)</i> ...	...	R. G. BRETT, Dip. Agric. (Harper- Adams). (Arrived on first appointment on 26th December, 1948.)
<i>Government Chemist</i> ...	...	W. E. CALTON, B.A., A.R.I.C., Dip. Agric. (Cantab.).
<i>Manager of Plantations</i> ...	...	I. G. C. SQUIRE.
<i>Inspector of Produce</i> ...	...	A. C. E. CALLAN.
<i>Veterinary and Livestock Officer</i> ...	...	J. C. ALLEY, M.R.C.V.S. (Dublin). (Arrived on first appointment on 26th January, 1948.)

TEMPORARY DEVELOPMENT STAFF

<i>Farm Manager</i> ...	...	Wing-Commander J. BARRET, D.F.C., Cert., Egerton School of Agriculture. (Arrived on first appointment on 23rd January, 1948.)
<i>Agricultural Development Officer</i> ...	...	G. D. WILKINSON, B.Sc. (Lond.), N.D.A. (Arrived on first appointment on 18th February, 1948.)
<i>Forest Officer</i> ...	...	A. L. GRIFFITH, O.B.E., M.A., D.Sc. (Arrived on first appointment on 9th August, 1948.)

Mr. FAZAL DIN AHMEDI, G.P.V.C., Non-European Veterinary Officer, proceeded on leave prior to retirement on 23rd February, 1948.

PREFACE

A SUMMARY OF THE AGRICULTURAL POLICY OF GOVERNMENT

I.—LAND

The mortgaging and alienation of agricultural land owned by Africans and Arabs is controlled and restricted by Boards instituted for this purpose under the Land Alienation Decree.

II.—FOOD AND NUTRITION

The active encouragement of the increased production of food crops and stock assisted by—

Food Crops

- (1) The introduction and selection of higher yielding strains of existing crops.
- (2) The introduction, trial, and acclimatization of new food crops, with especial reference to those of improved nutritive value.
- (3) The issue of seeds and planting materials from demonstration stations and other plots throughout the Protectorate.
- (4) The reclamation, drainage, and irrigation of swamp areas in order to facilitate the production of rice and other food crops.
- (5) The demonstration of the possibility of growing vegetables, experimentation as to types of vegetables which flourish locally, and the general encouragement of the industry.

Livestock

- (1) The use of quarantine methods for all imported cattle, sheep, and goats to prevent the introduction of diseases from which the Protectorate has hitherto been free and to limit the possibility of the re-introduction of diseases which have occurred from time to time in epidemic form.
- (2) The control of East Coast Fever by a system of dips throughout both islands.
- (3) The eradication or control of the tsetse fly in Zanzibar Island, and the prevention of its introduction into Pemba Island.
- (4) The breeding of improved quality cattle, sheep and goats for sale to local farmers and dairymen.
- (5) The castration of inferior males.
- (6) The prevention of slaughter for food of useful female breeding stock.
- (7) The distribution of setting eggs and good strains of superior breeds of poultry.

III.—FORESTRY

1. The Conservation of existing forest with especial reference to the control of erosion and the maintenance of climatic conditions suitable for agriculture.

2. The afforestation of certain areas, with especial regard to the better utilization of the karst country, to provide fuel and timber for domestic and industrial purposes.

3. The conservation and controlled exploitation of the mangrove forests in order to regularise exports of bark to the best advantage and to ensure domestic supplies of poles and fuel.

4. To foster by education and propaganda a real understanding among the people of the Protectorate of the value of forests to them and their descendants.

5. To encourage and assist the practice of sound forestry by local authorities and private enterprise.

IV.—EXPORT CROPS

1. The departure from a two-crop economy (cloves and copra) by the propagation, testing, and encouragement of the growing of cacao as a third permanent export crop.

2. The encouragement of possible exportable crops, such as derris, chillies, tobacco, pawpaws for papain and fruit.

V.—MARKETING

1. The Clove Growers Association guarantee a fixed minimum price to growers for their clove crops. This price is adjusted yearly in conformity with market conditions. It provides facilities by which growers can obtain cash advances against their crops for a limited period.

2. The Association, acting on behalf of the Ministry of Food, also arranges all exports of copra and coconut oil on a price basis effective until 31st December, 1950.

3. All exports of tobacco are arranged through the Association, and a guaranteed price is offered for chillies.

VI.—PRODUCE QUALITY STANDARDS

1. Pre-sale examination of cloves, clove-stems, copra, and mangrove bark, under an Adulteration of Produce Decree.

2. Examination before export of cloves, coconut oil, mangrove bark, and chillies, accompanied by grading according to determined standards.

3. Either pre-sale examination or grading prior to export of any other crops in respect of which such action is considered to be necessary.

4. Assistance in the construction and improvement of copra kilns.

VII.—CREDIT

Loans, secured on the crops themselves, for the cultivation and general improvement of plantations and advances against crops for picking expenses, are provided through the medium of the Clove Growers Association, an organization under the ægis of Government.

VIII.—AGRICULTURAL EDUCATION

1. The training at Makerere of suitable candidates for higher posts in the subordinate technical staff.

2. The further training of those holding higher posts in the subordinate staff to fit them to fill senior staff posts.

3. The training at Kizimbani of all potential field assistants.

4. The provision of training courses for sons of farmers and others wishing to become progressive farmers.

5. The inculcation of a liking for farming and gardening, by the provision of school gardens, by all undergoing primary and secondary education.

Annual Report of the Department of Agriculture, 1948

SECTION I.—AGRICULTURE IN THE PROTECTORATE

GENERAL

1. Apart from limited imports of rice, occasioned by the continued world shortage of this commodity, and the somewhat restricted supply of sugar, it may be said that all imported foodstuffs were in sufficient supply. In fact, in some cases, the Protectorate was not able to take up its programmed requirements.

2. Rainfall throughout the Protectorate was almost everywhere above average, the most noteworthy feature being the excellent short *vuli* rains, which continued right up to the end of the year. This, though not affecting 1948 production, had the psychological effect of helping to keep local food prices at a reasonable level.

3. Cocoa planting was on rather a reduced scale owing to the partial failure of the Java Criollo crop, but there was sufficient planting material to satisfy all reasonable private requirements and to extend Government plantings. Sufficient data has now been obtained to indicate the unsuitability of certain local soil types for this crop.

4. A start was made with the steady production of papain from the Kizimbani plots, coupled with the preparation of outside planters' latex if brought to the kiln for this purpose. Unfortunately the catastrophic drop in price has rendered these efforts of little effect.

5. A further eighteen cultivators took up 11,500 derris cuttings. Unfortunately neither they nor the previous year's growers took sufficient care of their plots, with the result that at the end of the year there were only 8,710 survivors out of 30,068 cuttings distributed during 1947 and 1948. This is regrettable, as the crop can at present be extremely profitable.

6. Despite the distribution of many tens of thousands of free chillie seedlings both in Zanzibar and Pemba little if any real progress has been made. In Pemba unfavourable weather conditions caused many deaths in the field, and the crop as a whole remains unpopular.

7. Tobacco-growing continues to flourish. There are two distinct prepared products. A local chewing tobacco with the midribs of the leaves removed, and an export tobacco called "Barawa". Despite some complaints as to the price offered for the latter, which has remained unchanged since 1942, it is expected that some eighty-five tons will be exported from the 1948 season's crop, as opposed to sixty-three tons of the 1947 season.

8. Kapok remains in demand, and as a small man's crop it offers considerable attractions. Interest in coir fibre and coir rope is maintained, but the former can never successfully meet world price competition until decorticating machinery is available.

9. Though it does not normally flourish below an altitude of 3,000 feet the true Tung *Aleurites montana* is being given a trial.

AGRICULTURAL DEVELOPMENT PROGRAMME

10. The appointment of an Agricultural Development Officer early in the year, together with that of a Farm Manager for Kizimbani, the latter releasing more experienced staff for development work, has enabled much more satisfactory progress to be made.

11. Development work at the two sub-experimental stations is now nearing completion and an extensive programme of crop-testing and general experimental work is in hand. At Matangatwani one of the most interesting features has been the rapid and sturdy growth of the "Bule" type of Criollo cacao, some plants of which have cropped extensively in their second year in the field.

At Hanyegwa Mchana the experimental forest plots are furnishing a most useful indication as to the types of tree most likely to be suitable for general afforestation and fuel reserves.

12. By the end of the year land had been acquired for six of the eight demonstration plots. Of the remaining two, one is being established on a small scale on existing Government land, and one has been reduced in scope to a small permanent crop demonstration plot.

13. The work of these stations naturally varies according to the locality and soil type. Limbani in Pemba concentrates on irrigated rice and vegetable production and Ole and Chambani in the same island on cattle and erosion control respectively. In Zanzibar, Kisongoni is devoted to rice grown on the plains, and entirely dependent on rainfall, and Muongoni to problems connected with the almost soilless coral rag.

14. Twenty acres of land for the vegetable-growing scheme have been acquired and work has commenced, but land tenure difficulties still preclude development of a full-scale irrigation project.

15. The engines for the various processing units are still awaited. High initial costs and supply difficulties have resulted in some curtailment in the scale of the original scheme.

16. Kiln construction and improvement is becoming increasingly popular. In Zanzibar fifty-nine new kilns were constructed and eight repaired. In Pemba the corresponding figures are thirty-eight and twenty-seven. In Zanzibar especially a very marked improvement in the quality of copra has resulted.

17. Five dips were completed during the year and compulsory dipping instituted in the area adjacent to the former Kizimbani dip. It has unfortunately been necessary to supplement propaganda with fines in order to enforce compliance with the order, but the response is now appreciably better.

18. The Kizimbani Stock Farm has maintained steady progress as evinced by the application of a standard form to the data of the years from 1942 onwards. It is probable, however, that much of the advance to date has been due to improvement in management rather than to any genetical factor. The experiment of "open air" calf rearing has been tried with considerable success.

19. The first year of the "Young Farmers Course" was attended by six schoolteachers from the Education Department, and six others, either themselves interested in cultivation or the sons of landowners, their ages ranging from thirty to seventeen. While the teachers obviously enjoyed and derived considerable benefit from the course the response from the others, especially the younger boys, was disappointing.

20. A temporary Forest Officer under the Development Programme has now been appointed, and a preliminary report on the forest problems of Zanzibar Island, with especial reference to the mangrove swamps, has already been prepared. Attention has been increasingly directed to the heavy consumption in Zanzibar of fuel for lime and charcoal-burning, and the danger to the island's fuel resources thereby caused.

21. The Jozani forest, with a total area of 1,475 acres, and a natural tree climax of Alexandrian Laurel (*Calophyllum inophyllum*) and *Vitex cuneata*, has, owing to a purchase during the year of 484 acres from a private owner, become the exclusive property of Government. The area also forms a unique nature reserve.

22. As a result of the visit of two entomologists from the East African Tsetse and Trypanosomiasis Research and Reclamation Organization an investigation is now being carried out as to the breeding and environmental habits of *G. austeni*, the only species known to exist in Zanzibar. This should be of the greatest value in showing the way towards control or elimination of tsetse and trypanosomiasis.

CLOVE RESEARCH SCHEME

23. The work of the Clove Research Scheme continued throughout the year and though there is as yet no absolute proof it is considered virtually certain that the disease known as "Sudden Death" is caused by a pathogen, with a more than strong probability that this pathogen is a virus.

24. A horticulturist was appointed during the year and as a reasonably reliable grafting technique has now been perfected the chances of settling the virus question one way or the other have improved considerably.

25. Confirmation of this fact would inevitably involve control measures of one kind or another, and a series of discussions to this end have taken place during the year.

WEATHER

26. The rainfall in all areas of both Zanzibar and Pemba was considerably above normal, typical representative figures being 76.01 inches at the Victoria Gardens in Zanzibar town as against an average of 62.95 inches for the past eleven years and 94.02 inches at Wete as against an average of 77.02 inches for the past twenty-eight years.

27. The *vuli* or short rains were the most outstanding feature, continuing right through December. Though this augurs well for root crops, preparation for rice was thereby much hindered.

PRINCIPAL CROPS

28. *Cloves*.—The clove crop for the seasonal year July, 1947, to June, 1948, was 10,916,496 pounds, equivalent to 311,894 frasilas of 35 pounds each. This is about half an average crop. The percentage from Pemba increased slightly to 90.08 per cent. The bulk of this total again came from a *vuli* crop, much of the harvesting in Pemba being as late as January and even February.

29. There was a fair *mwaka* crop during 1948, a proportion of which remained unpicked owing to the incidence of Ramadhan. A moderate *vuli* crop has been very thoroughly picked, and up to the end of the year a total of 11,198,231 pounds had passed through the market.

30. Exports rose to 28,926,100 pounds, being 7,282,679 pounds more than the average for the preceding twenty years, and as the result of the poor crop in 1947 and the moderate crop in 1948 stocks are probably as low as they have ever been in the history of the present-day industry.

31. The Clove Growers Association only purchased 3,643,644 pounds of buds during the year, with the result that the percentage to be compulsorily purchased by shippers under the Clove Export Decree remained at nil throughout the year.

32. The buying price of the Clove Growers Association per 100 pounds of fair quality cloves was raised from Shs. 45 to Shs. 52 as from the 1st July, and towards the end of the year it was announced that it would be again raised to Shs. 60 as from the 1st January, 1949. The prices of all other grades were increased in proportion. As hitherto the Pemba buying price was in every case Sh. 1.38 less. The buying price for stems remained unchanged at Shs. 13.50 for commercial and Shs. 12.50 for inferior quality.

The Association's selling price for buds remained at Shs. 7 more than the buying price for all grades.

33. The year opened with open market prices round about Shs. 47, hardening in May to Shs. 51 and as a result of the free issue of import licences for India reaching Shs. 65 in June. By the end of the year the threatened shortage of buds, coupled with the impending raising of the Clove Growers Association buying price, had produced bids as high as Shs. 77.

A first direct shipment to Java of 2,400 bales was made in May.

34. India was still by far the biggest buyer with 17,282,554 pounds or 65.08 per cent of the total, followed by the Straits Settlements with 24.67 per cent, and the Dutch East Indies with 3.01 per cent. All other destinations therefore totalled 7.24 per cent only. This denotes a greatly increased demand from India and the Straits Settlements rather than a falling off from Europe and other minor destinations.

35. Mainly on account of the price negotiations which took place during the second half of the year, and still remain unconcluded, exports of clove oil fell to 333,956 pounds.

36. Except during the period of Ramadhan pickers were everywhere plentiful and picking rates reasonable, not rising above thirty cents a pishi.

37. *Coconuts*.—Practically all the locally produced copra was milled locally during the year and exported as coconut oil, figures being as follows:—

			<i>Copra equivalent</i>	
			<i>Tons</i>	
Copra (702 tons)	...	...	...	702
Coconut Oil (3,161 tons)	...	...	...	5,251
Soap (542 tons)	...	...	...	542
			6,495	

Yields tended to be below normal and in addition, owing to the impending rise in price, some 1,696 tons of oil and 2,138 tons of copra were carried over into 1949.

38. The Ministry of Food's prices remained unchanged throughout the year, but in early December negotiations were concluded which gave effect to an increase in the price of F.M.S. copra from £30 10s. to £54 10s. and of oil from £50 4s. to £89 per ton.

39. Local copra prices during the year varied as follows. In every case they are in shillings and cents per 100 pounds:—

Quarter ending :	<i>F.M.</i>			<i>F.M.S.</i>			<i>B.S.D.</i>		
31st March	...	...	31.42 — 20.71	...	30.71 — 21.43	...	31.42 — 22.14	...	...
30th June	...	...	30.71 — 21.43	...	31.42 — 22.86	...	32.14 — 24.29	...	...
30th September	...	...	31.42 — 21.43	...	32.14 — 22.86	...	32.85 — 26.42	...	...
31st December	...	...	35.71 — 21.43	...	36.43 — 23.57	...	37.14 — 23.57	...	...

NOTE.—F.M.=Fair merchantable; F.M.S.=Fair merchantable sun-dried; B.S.D.=Best sun-dried.

The average price realized during the year for copra from Government plantations was Shs. 33.40. It is interesting to note that as recently as 1945 the corresponding figure was Shs. 15.60 only.

40. *Mangrove Bark*.—Only 2,295 tons were shipped during the year, and the forests are now closed until further notice.

41. Price ranged from Shs. 160 to Shs. 140 a ton at the beginning of the year, but fell to the neighbourhood of Shs. 100 per ton by August. There were no exports after March. Considerable trouble was experienced in enforcing thickness standards.

FOOD CROP PRODUCTION

4. On the whole 1948 may be said to have been a very satisfactory year, especially as regards rice production. In Zanzibar a record acreage of this crop was planted, and at least as much in Pemba as in any other recent year. Yields were on the whole up to average, though a good deal of damage was done by Army Worm *Laphygma* sp. in the Chaani and Mahonda rice plains of Zanzibar.

At no time was there any shortage of seed. Comparative figures for production in both islands are as follows:—

ESTIMATED PRODUCTION OF PADDY IN TONS					
	<i>Zanzibar</i>		<i>Pemba</i>		<i>Total</i>
1945	...	...	8,368	...	10,000
1946	...	...	8,618	...	5,000
1947	...	...	5,700	...	4,585
1948	...	...	9,780	...	6,365
					18,368
					8,618
					10,285
					16,145

43. Pulse and sweet potato planting in the rice stubbles was reasonably satisfactory in Zanzibar but disappointing in Pemba. Cultivators generally speaking prefer sweet potatoes to pulses owing to the uncertain yields from the latter.

44. Cereals on the eastern seaboard of both islands yielded reasonably well, but with considerable variations from place to place according to local weather conditions.

45. The chief disappointments were cassava planting in southern Pemba, and, to a lesser extent, the drive to induce Zanzibar town idlers to plant cassava in November. Despite practically everything being done for the latter, except the actual work, the response was only moderate.

46. Imported foodstuffs were not actually in any greater supply than during 1947, but, owing to better local crops, the demand for them was much less. Card rationing now only applies to sugar and simsim oil, and towards the end of the year increased supplies of sugar were promised which should enable this article to be put on distribution control only.

47. A considerable quantity of planting material of different food crops was either distributed free or sold to cultivators. A detailed list will be found in Appendix III.

48. Comparative sales for foodstuffs in the Estella market were as follows:—

			<i>Fish</i>			<i>Fruit</i>			<i>Vegetable</i>			<i>Staple starchy</i>
			<i>lb.</i>			<i>Pakachas</i>			<i>Pakachas</i>			<i>Food</i>
												<i>Pakachas</i>
1945	...	...	208,162	...	39,021	...	48,654	...	77,675			
1946	...	...	183,160	...	65,479	...	43,581	...	72,218			
1947	...	...	194,245	...	29,140	...	43,434	...	67,795			
1948	...	...	212,593	...	50,551	...	57,872	...	58,753			

49. Appendix IV gives particulars of the exports of all natural non-mineral products. The following comparison of export values will be of interest:—

				<i>Percentage of Total Exports</i>							
				<i>1945</i>	<i>1946</i>	<i>1947</i>	<i>1948</i>				
Cloves and Clove-Bud and Stem Oil	68.57	...	73.15	...	58.60	...	74.99				
Coconut Products	...	...	24.98	...	16.81	...	33.18	...	19.52		
Mangrove Bark	...	...	5.02	...	8.14	...	4.73	...	1.71		
Other	...	...	1.43	...	1.90	...	3.49	...	3.78		

Clove-bud exports were exceptionally heavy and, as stated elsewhere, much copra and coconut oil was carried over at the end of the year.

SECTION II.—WORK OF THE DEPARTMENT OF AGRICULTURE

GENERAL

50. *Staff*.—Mr. O. S. Swainson was appointed Director of Agriculture as from the 22nd December of the previous year, Mr. R. O. Williams, O.B.E., the previous Director having been appointed General Manager of the Clove Growers Association. Mr. A. K. Briant was appointed Senior Agricultural Officer as from the same date, and subsequently acted as Director of Agriculture from the 31st May to the 2nd October. Mr. G. E. Tidbury acted as Senior Agricultural Officer from the same date until the end of the year. Mr. F. B. Wilson, M.B.E., Agricultural Officer, proceeded to Kenya on transfer on the 6th February and was replaced by Mr. G. W. Anderson, Agricultural Officer, who arrived on the 1st March. Mr. G. D. Wilkinson and Mr. R. G. Brett were appointed as Agricultural Development Officers as from the 17th February and the 8th November respectively. Wing-Commander J. Barrett, D.F.C., was appointed as Farm Manager on 22nd January. Dr. A. L. Griffith, O.B.E., was appointed Temporary Forest Officer as from the 1st of August.

The Director and Acting Director continued to fulfil the functions of Food Controller and were Members of Legislative Council and His Highness' Executive Council while in office.

51. *School Gardens*.—The five teachers who took the "Young Farmers Course" displayed keen interest in the work, and it is hoped that as more and more have been through the course that the standard of school gardens will correspondingly improve. Otherwise there is little to report. One or two gardens reflected the interest of the teachers concerned, but the majority remained mediocre.

52. *Migombani Gardens*.—The Botanic Gardens at Migombani were maintained during the year and three small nurseries were established for fruit trees, ornamentals and timber trees. Altogether some 10,000 plants were raised for sale to the public. The interest taken in this planting material was very disappointing, however, only 2,076 plants being taken up of which 1,609 were used by Government departments.

53. *Compost Manufacture*.—Sales during the year totalled 372 tons and free issues 157 tons, a total of 529 tons as compared with a corresponding figure of 743 tons in 1947. Towards the end of the year, owing to the fencing of the quarantine area and the impending closing of the vegetable gardens, a start was made with the moving of the "factory" to a site closer to the dairies.

54. The departmental baling press was in use for thirty-one days, mainly in the pressing of kapok floss.

55. *Copra Cess Board*.—The Copra Cess Board functioned successfully throughout the year, its main activities being in connection with the raising of coconut seedlings for sale and the repair and improvement of copra kilns. Some 165,000 seedlings were raised in Zanzibar and 10,000 in Pemba. In addition 1,519 seedlings were raised and distributed departmentally in Pemba.

56. The Agricultural Advisory Committees continue to meet. Though they do both undoubtedly serve a useful purpose this could be much enhanced in the case of the Zanzibar Committee were the members more inclined to present their own views as private and responsible individuals rather than those of outside organizations.

CLOVE REGENERATION

57. The following are the details of seedling distribution during the year:—

		Zanzibar		Pemba		Total
Sold	...	38,925	...	23,809	...	62,734
Issued free	...	83,030	...	13,804	...	96,834
Not taken up	...	37,038	...	42,387	...	79,425
		<u>158,993</u>		<u>80,000</u>		<u>238,993</u>

Total distribution was only 159,568 as compared with 223,478 in 1947.

The increased price of coconut products has undoubtedly contributed to the falling off in the demand for clove seedlings.

58. Provision for 1949 is as follows:—

		Zanzibar		Pemba		Total
Protectorate Funds	...	50,000	...	40,000	...	90,000
Colonial Development and Welfare free distribution	...	70,000	...	30,000	...	100,000
Clove Growers Association free distribution	...	30,000	...	20,000	...	50,000
		<u>150,000</u>		<u>90,000</u>		<u>240,000</u>

59. In view of the increased number of coconut seedlings being raised for distribution, provision for 1950 is to be reduced to 85,000 clove seedlings in Zanzibar and 40,000 in Pemba, 125,000 in all.

These numbers will almost certainly be supplemented to some extent by a carry-over of seedlings from 1949 which, as a measure of economy, will be distributed to those who wish for them.

DISTRIBUTION OF PLANTS AND SEEDS

60. The importation of vegetable seeds suitable for tropical conditions continues, and a small quantity for vegetable seed is also produced at Kizimbani.

In addition very considerable numbers of budded citrus plants, seedlings of various fruits, and other useful planting material was sold or distributed free during the year. A full list is given in Appendix V.

GOVERNMENT PLANTATIONS

61. From the summarized statement, Appendix I, at the end of the report, it will be seen that the plantations showed a profit of Shs. 22,338 as opposed to a loss of Shs. 16,690 in 1947. Even allowing Shs. 12,904 for the cost of the lorry and Shs. 7,700 for liabilities under the salaries revision a profit would still be shown, which, considering the considerable acreage of as yet unproductive cocoa, is not at all unsatisfactory.

62. Appendix II analyses the position of the four plantation groups. Only Selem still shows a small loss, which can be more than offset by the value of the development there during the year.

63. The number of coconuts harvested during the year was approximately the same as during 1947, being about twenty per cent below average.

Comparative figures are as follows:—

1944	1945	1946	1947	1948
2,413,012 ...	2,263,571 ...	2,679,630 ...	2,067,931 ...	2,062,182

A general improvement in the appearance and productivity of mature trees was noticeable towards the end of the year.

64. During the year 2,143,733 nuts in all were dealt with as follows:—

	Nuts			Nuts	
Brought forward ...	70,613		Husked for copra ...	1,749,200	
Gathered ...	2,045,310		Sold ...	221,189	
Collected by patrols ...	21,810		Rotten and unsaleable ...	11,452	
			Carried forward ...	161,892	
	2,143,733			2,143,733	

65. The average price realized per 1,000 nuts during the past five years is as follows:—

1944	1945	1946	1947	1948
Shs. 40/85 ...	Shs. 45/62 ...	Shs. 55/37 ...	Shs. 62/52 ...	Shs. 105/70

Copra made during the same period and the average prices realized are given below:—

	1944	1945	1946	1947	1948
Tons of copra ...	306	343	287	269	264
Average price per ton	Shs. 317/00	Shs. 349/50	Shs. 460/00	Shs. 539/00	Shs. 748/50

66. As from the 27th July rates of pay to huskers and breakers were increased from Shs. 2 to Shs. 2/75 and from Shs. 3/75 to Shs. 5 per 1,000 nuts respectively.

Cloves and Stems harvested during the past four seasons have been as follows:—

	Green Cloves		Dry Cloves		Dry Stems		Average price per 100 lb. Dry Cloves
	lb.		lb.		lb.		Shs.
1945/46 ...	3,747	...	1,185	...	342	...	51/25
1946/47 ...	273,692	...	87,032	...	24,368	...	52/28
1947/48 ...	11,202	...	3,691	...	1,048	...	47/04
1948/49 ...	48,792	...	15,951	...	4,828	...	68/24

67. Owing to shortage of seed the Selem cacao nursery was temporarily discontinued.

Cacao seedlings were received from Kizimbani for planting at Selem and Langoni, and planting can be summarised as follows:—

	1946	1947	1948	Total
Selem (sakafu) ...	2,702	2,633	—	5,335
Selem (Mfenesini) ...	—	1,800	564	2,364
Langoni ...	756	4,063	1,119	5,938

68. A twenty-acre forest block of different useful species is being established at Selem.

THE WORK OF THE EXPERIMENTAL STATIONS

69. The number and scope of the experiment stations and demonstration plots was greatly increased during the year as the programme of crop development under the auspices of the Colonial Development and Welfare Act was more fully implemented. Previously, investigational work was carried on solely at the Kizimbani Experiment Station, with minor activities at Mkwajuni and Weni seed stations in Zanzibar and Pemba respectively.

70. The organization of experimental work for crop development is now as follows:—

Main Experiment Station	...	...	Kizimbani, Zanzibar.
Sub-Experiment Stations	...	...	Hanyegwa Mchana, Zanzibar. Matangatwani, Pemba.
Demonstration Plots	...	...	Mkwajuni and Kisongoni, North Zanzibar. Selem, Central Zanzibar. Muongoni, East Zanzibar. Makunduchi, South Zanzibar. Weni, North Pemba. Ole, Central Pemba. Chambani, East Pemba.
Demonstration Station for Vegetables	...	...	Kibonde Mzungu, Zanzibar.

71. Of the above stations all except Makunduchi and Kibonde Mzungu were to a greater or lesser extent in operation during the year, and these are expected to commence their activities early in 1949.

72. After some preliminary delays occasioned by the difficulty in acquiring suitable land, work commenced at most stations with the construction of essential buildings and stone walls to protect crops from wild pig. In Pemba where several of the stations are on hilly land, an important activity has been the construction of terraces and drains for soil conservation purposes.

73. The most important buildings completed during the year are as follows:—

At Kizimbani a building was constructed to house a power-plant and processing machinery for use of the public. The machinery is partly installed and a rice mill is ready for use.

At Hanyegwa Mchana a pair of labourers' quarters, cattle byre, cattle dip and a long stone wall round the entire station were completed, and a house for the Agricultural Development Officer, who resides on the station, was under construction.

In Pemba, the sub-station at Matangatwani was provided with houses for Assistant Agricultural and Veterinary Officers, the overseer and headman. A cattle byre was also built.

On the Zanzibar demonstration plots a pig-proof stone wall and an overseer's house were constructed at Muongoni and the building for the processing machinery was built at Selem.

All these buildings were constructed from funds provided by Colonial Development and Welfare Scheme. The work of supervision was, with one exception, undertaken departmentally.

74. The outstanding experimental work of the year was a series of fertilizer trials undertaken in conjunction with large-scale fertilizer investigations on settled and native areas on the mainland.

75. A preliminary experiment with maize was reported last year in which a single application of sodaphosphate, a local East African product, increased yield of maize by 63 per cent and of the following crop, cowpeas, by 48 per cent.

These two crops were followed by a crop of dwarf sorghum, without any re-application of manures, and although the plots previously fertilized with sodaphosphate produced a yield of sorghum 22 per cent greater than the control, this difference was just not statistically significant.

76. This year's trials were of an exploratory nature and designed to elucidate the needs of our soils for phosphates as well as for nitrogen, potash, humus and lime. The main rains experiments were with rice, maize and sorghum and these were followed with pulses, sweet potatoes and sunflowers.

77. These large-scale field experiments were augmented by a series of 30 small-scale experiments in the form of microplots using the same designs and dressings. The microplots were located so that the various soil types described by the Government Chemist in last year's report could be tested as regards their nutrient status.

78. The microplots and field experiments both gave results which indicated clearly that all soils were in need of nitrogen and compost but that their status as regards potash and phosphate depended on their origin. The *changa* soils, derived from re-sorted mainland debris, appeared to be relatively rich in potash and low in phosphate, while *kinongo* soils, derived from the weathering of recent calcareous deposits, were rich in phosphates but in need of potash.

79. The role of lime is still far from clear. On certain acid soils rice yields were increased by liming and a late crop of sweet potatoes also responded markedly to lime. In the microplots, however, lime entered into a series of negative interactions with the other factors, notably nitrogen, and yields were markedly decreased.

80. These investigations were carried out in conjunction with parallel investigations by the Government Chemist, especially as regards the role of the minor elements.

The results of the various field fertilizer experiments are shown in Appendix VI.

81. A second aspect of the general problem of soil fertility in Zanzibar which is receiving some attention is the problem of cropping the coral rag areas. A system of shifting cultivation prevails in these areas which includes burning the bush, and then cropping for a limited number of years followed by a lengthy resting period. Increased pressure on the land during the last decade caused by the demands for fuel for lime-burning and the need for the production of more home-grown food has reduced the resting period and investigations have commenced to investigate the possibility of the balance between cultivated and resting land being improved without further loss of fertility.

82. Both at Hanyegwa Mchana and Muongoni large areas of land are now being cropped in preparation for comprehensive régénération experiments next year. Also at Muongoni a trial is in progress which aimed at the conservation of soil humus by a system of composting and manuring in place of burning the bush. So far there is every indication that a burn of some sort is essential if reasonable yields are to be obtained.

83. The initial area of the experiment consisted of an acre of bush which was divided into two before the *masika* rains and one-half burnt according to the native practice. The other half was slashed to ground level and the slashings built into a compost heap. The first crop, maize, did badly on both plots but yielded only fifty-four pounds per acre on the unburnt area as compared with 144 pounds per acre on the burnt.

84. Each plot was then sub-divided again and each half dressed with mixed artificials at $2\frac{1}{2}$ cwt. per acre and the whole area planted to cowpeas.

Again the burnt area yielded much better than the unburnt, the half with artificials at 210 pounds per acre and that without artificials at ninety-three pounds per acre. In contrast, even the dressing of artificials did not increase the yield in the unburnt area which yielded at sixteen and twenty pounds per acre only.

A crop of maize and gram is now on the land and it is intended to return the compost to the unburnt half before the next *masika* crop.

85. Other investigational work of interest is reported below under the crops concerned, arranged in alphabetical order.

86. *Arrowroot* continues to bear well at Kizimbani. The stock plot has been increased in size and starch is prepared on a small scale for use on the station.

87. *Bambarra groundnuts* are rarely heavy croppers but are relished by the local people and stock plots are maintained for seed supply. One plot at Kizimbani yielded very poorly at 200 pounds per acre.

88. *Bananas*.—The varietal collection of nearly thirty local types has been maintained at Kizimbani and similar collections established at several outside stations on differing soil types. Certain varieties are showing themselves markedly superior on the coral soils.

At Hanyegwa Mchana, on thin coral soil, six varieties came into bearing during the second half of the year. The best variety, *Koroboi*, yielded sixty-six bunches weighing 588 pounds per acre and is growing very vigorously. A great deal of damage to bananas by wind is experienced on the open plains the variety *Koroboi* appearing to suffer least in this way.

During the year Professor R. E. D. Baker's Banana Breeding Expedition from the West Indies visited the Protectorate and examined the banana collections. Seeds of certain wild forms and cultivated varieties which are probably diploids were taken away by the expedition and planting material of some fourteen local varieties has been sent to Kew.

89. *Cashew*.—The demonstration blocks of cashew established at five centres in Pemba are now in bearing. These are all on light sandy soils.

At Hanyegwa Mchana a block has been planted on thin *wanda* soil overlying coral and, so far, has grown exceedingly badly. The Government Chemist is of the opinion that the poor growth may partly be due to

deficiencies of certain minor elements of which iron is almost certainly one. These plants are being used by him for leaf injection experiments and other techniques for investigating minor element deficiencies.

90. *Cassava*.—Amani varieties *Aipin valenca* and 4026/20 are still being retained on the station and show considerable promise.

The variety trial of locally produced seedling varieties was reaped and several varieties produced high yields, variety K19 being the best at over fourteen tons per acre. This variety trial has been re-planted with the same varieties for a second year as a considerable number of roots were stolen from the previous experimental area and statistical analysis of the results could not be undertaken.

The production of these seedling varieties from the parent variety *Msitu* continues and several promising clones have been planted out for multiplication during the year.

91. *Centrosema*.—The block of *C. plumieri* planted last year, has maintained itself well and is being extended. After Kudzu, *C. plumieri* is our most promising cover crop.

92. *Chillies*.—Plots of chillies were maintained on nearly all the departmental stations for demonstration and seed selection.

93. *Citrus*.—An excellent crop was obtained in the Kizimbani orchard where, in spite of a great deal of premature fruit fall, orange trees bore at the rate of 278 fruits per tree and grapefruit at 158. The yields of all trees and the quality of the fruit are recorded and the best trees are used as sources of budwood.

A disease of citrus plants in the nursery was observed during the year at Kizimbani. This takes the form of large, unsightly galls at the collar and point of insertion of the bud. It is considered that this disease may be spread, on the knife, by the budders and steps have been taken to discard all galled material and sterilize the budding knife between operations on neighbouring plants. A small block of galled plants has been established in an isolated area for further observation.

At Hanyegwa Mchana a block of citrus planted on the thin coral soil during the main rains is making excellent progress.

94. *Cloves*.—Only a small clove crop was reaped this year and several of the permanent experiments, including the long-term manurial trial, the nitrogenous manuring of saplings trial, and the shade tree trial did not yield.

95. The trial of artificial manuring of clove saplings in Block KBB gave a fair yield of cloves however. This year's crop was expected with considerable interest as, last year, sodaphosphate (which has caused large increases in the yield of annual crops) was applied instead of superphosphate which has never caused positive responses with cloves or any other crop at Kizimbani.

1948 results did not quite achieve statistical significance though there was an increase of 3.5 pounds green cloves per tree due to phosphate in a 13.5 pounds average crop. This gives some hope that future dressings of sodaphosphate may cause significant increases in clove yields.

The response to nitrogen, 1.2 pounds per tree, was surprisingly small this year and, as in previous years, a sharp decrease in yield was caused by the interaction between nitrogen and potash. This year this was as great as 4 pounds per tree. Potash alone increased yields by 2.7 pounds per tree.

96. The manurial trial of seedlings in the nursery was maintained and the first thinning is now due. There is no external indication that fertilizers have caused increases in the growth of seedlings after eighteen months in the nursery.

97. The Clove Yield and Indicator Plots were inspected each month in order to record the development of the crop. Harvest yields were also recorded. Several new yield plots were chosen in Zanzibar in place of others decimated by Sudden Death.

98. *Cocoa*.—Seedling *criollo* cocoa planted in 1946 has flowered during 1948 and several saplings in the more successful blocks have borne fruit. The Bule variety at Matangatwani in Pemba and the Dunga variety on the light soils around Selern in Zanzibar have grown excellently. On the heavier soils at Kizimbani seedling *criollo* continues to make poor progress though *criollo* budded on *forastero* stocks leaves little to be desired.

99. The severe die-back of seedling cocoa at Kizimbani is now considered to be due mainly to the attacks of *Helopeltis* sp. and, so far, all efforts to deal with this pest by dusts and sprays have been unsuccessful. Leaf-eating weevils and other sucking insects such as Lygids also cause considerable damage.

100. The several privately owned plots of cocoa have been regularly visited by members of the department staff and, on the lighter soils, considerable progress has been made by the young cocoa plants where the owner has afforded them adequate care and attention.

101. Preparations were made during the year to establish several plots throughout Zanzibar in which to compare the ease of establishment of *forastero* cocoa with the *criollo* types from Bule and Dunga. One of these plots, at Kizimbani, will be incorporated in a nine-acre shade tree trial in which the following shade trees were planted this year:—

- Cassia siamea*.
- Peltophorum ferrugineum*.
- Pithecolobium saman*.
- Albizia falcata*.
- Gliricidia maculata*.
- Pterocarpus indica*.
- Jacaranda mimosæfolia*.
- Melia azedarach*.

The cocoa will be planted in 1949 if the shade, permanent trees and temporary shade in the form of bananas, is sufficiently advanced.

102. Advances have been made in the technique of rooting cuttings of cocoa in the solar propagator. After modifying the Kizimbani propagator to conform with those of the Imperial College of Tropical Agriculture in Trinidad and carefully following their recommended technique considerable success was obtained.

The best results were obtained with *chupon* cuttings of *criollo* cocoa though, in all cases, considerable casualties occurred when the rooted plants were hardened off.

103. The blocks of old trees at Dunga and Kinuni Moshi bore good crops this year although the greater number of pods were not yet ripe for harvest at the year's end. The harvest records from these blocks are shown in Appendix VII.

The following seedlings of Dunga type *criollo* cocoa were issued from the Kizimbani nursery this year:—

To Kizimbani	...	...	...	1,000
To Selem	...	...	...	1,000
To Langoni	...	...	...	1,925
To private planters	...	...	...	6,169
Total	...	...	...	10,094

104. The Government Chemist has undertaken numerous leaf injection experiments on the cocoa at Kizimbani with a view to determining whether a deficiency of any minor element is causing the poor growth observed on this station. No conclusive results have yet been achieved though there is some indication of a shortage of magnesium.

105. *Coffee*.—The coffee block at Mkwajuni, hitherto very unsatisfactory, improved in physical condition and bore a fair crop after removal of the Pemba grass (*Stenotaphrum dimidiatum*) planted between the trees and its replacement with kudzu.

The *excelsa* and *liberica* blocks at Kizimbani bore good crops. Heavy mulching with pen manure helped the *liberica* coffee to remain in good condition in spite of infestation with *Hemeleia vastatrix*.

The yields for the year are shown below:—

Variety	No. of Planted			Yields in pound of fresh berry						
	trees			1942	1943	1944	1945	1946	1947	1948
Excelsa	...	175	1939	116	380	278	952	889	972	3,241
Liberica	...	256	1938	568	962	320	868	2,130	335	2,775

NOTE.—A large proportion of the normal 1947 crop was harvested in early 1948.

106. *Cotton*.—Cotton of the variety BP 52B from Uganda was tried at Hanyegwa Mchana on very poor coral soil. Although heavy yields could not reasonably be expected with this crop, growth was reasonably good and a small crop of 78 pounds of lint plus 154 pounds of seed per acre was reaped.

Stainer attack was very serious and neither D.D.T. nor B.H.C. proved effective in controlling them.

107. *Cowpeas*.—The cowpea crop, as a whole, suffered badly this year from the attack of sucking insects including Jassids. Two field experiments with this crop had to be discarded owing to insect damage.

Cowpeas were planted in the fertilizer trials after the rice crop was lifted. The results are shown in Appendix VI. Significant positive responses to applications of compost were obtained at Hanyegwa Mchana and Mahonda and also to phosphates at the latter place. An interesting positive response to a mixture of minor elements was obtained at Hanyegwa Mchana. There is little doubt that our thin soils in the coral areas are deficient in minor elements, particularly iron.

At Kisongoni the nitrogen-phosphate interaction reduced yields as did the compost-phosphate interaction at Mahonda. It is considered not unlikely that these negative interactions, a feature of many trials in Zanzibar this year, are also connected with deficiencies in minor elements.

108. *Derris*.—A block of derris, $1\frac{3}{4}$ acres in area harvested at Kizimbani, yielded some 1,233 pounds of dry root containing seven per cent rotenone. The gross return of Shs. 1,630 for this crop indicates the considerable profit attached to derris-planting. The extension staff has been encouraging local planters to try derris for two years and efforts in this direction, including the provision of free rooted cuttings from public nurseries, will be increased in 1949.

109. *Eddoes*.—The Ceylon varieties, imported last year, proved complete failures under damp conditions. They have been re-planted in drier land for further trial.

110. *Groundnuts* have been planted at Kizimbani and Hanyegwa Mchana for the provision of planting material for the public. Yields are generally very mediocre, being only some 600 pounds per acre at Kizimbani and 300 pounds per acre on the thin coral soil, both of undecorticated nuts.

An attack of *Cercospora* sp. was recorded at Hanyegwa Mchana this year on groundnuts.

111. *Kapok*.—The young trees of the local, large podded selection (Ndagaa) are making good progress and should fruit next year.

The old blocks of Far-East varieties bore a better crop than usual though yields are still very low. The best average was from the Saigon trees, 3.34 pounds of lint per tree.

112. *Kudzu*.—Considerable extensions have been made this year to the area under Kudzu (*Pueraria phaseoloides*). All young clove areas, orchards and permanent tree collections at Kizimbani have been inter-planted and efforts have been made to establish Kudzu on other soil types.

The vine has grown well on the red, *kinongo*, soils at Mkwajuni and Makunduchi but makes very slow initial progress on the thin coral soils. On the latter soils it responds very markedly to dressings of compost and it is hoped that when, by its prolific leaf fall, more humic conditions are set up, the growth of the vine will also be good.

At Kizimbani several blocks of Kudzu are being cut regularly to provide cattle fodder. A single cut yields about $5\frac{1}{2}$ tons per acre of excellent green fodder, well-liked by adult cattle, and recovery from cutting only takes three to four months. Kudzu has also proved relatively drought-resistant.

113. *Maize* was used as the indicator plant in the series of microplots undertaken this year on the various soil types in Zanzibar. It was also used in some of the field experiments in the series of fertilizer trials.

At Kizimbani, maize responded to nitrogen and phosphate, as is now expected on *changa* soils, and also to compost dressings. Similar results were obtained at Matangatwani in Pemba with a further significant negative response to the lime-nitrogen interaction. This latter response was also observed in many of the microplots.

At Hanyegwa Mchana, on thin *wanda* soils, a very considerable response was observed to nitrogen and compost and it was also noted that larger and better formed cobs were reaped from those plots which had been treated with a mixture of trace elements.

Another experiment with maize at Kizimbani, in which three levels of sodaphosphate and two levels of nitrogen plus potash mixture were applied, indicated that the responses to phosphate and to nitrogen (it is not thought that potash plays a large part on *changa* soils) are mutually dependent to a considerable extent, response to one being achieved only in the presence of adequate supplies of the other.

The results of this experiment including the residual effect on a second crop, sorghum, on the same land, are shown in Appendix VIII.

114. *Niger seed*.—An importation of Abyssinian Niger seed (*Guezoitia*) was obtained from Kenya and tried at Kizimbani and Hanyegwa Mchana. At both stations good vegetative growth was obtained but no flowering was observed.

115. *Oil palms*.—The use of a new oil press caused a slight improvement in the quantity of oil produced from 100 pounds fruit, the figure for this year being 10.40 pounds which still compares badly with the 20 per cent normally obtained in other palm oil producing countries.

The general yield of the block was low this year as is shown in Appendix IX.

A new introduction was made from Malaya and seed is also expected shortly from Nigeria.

116. *Pawpaws*.—The yield of papain from $1\frac{1}{2}$ acres of Honolulu pawpaws was most disappointing, being only 0.42 ounce per tree. The new papain kiln produced a good quality product, samples of which were favourably commented upon at Arusha.

The sharp fall in papain prices this year combined with increases in labour costs in Zanzibar has, for the present at least, made profitable papain production impossible in Zanzibar. A further drawback to local production is the fast rate of ripening of individual fruits and the rapid growth of the tree. This causes fewer tappings to be made on individual fruits and shortens the period of useful tree size before replanting is necessary.

117. *Pigeon peas* yielded at the rate of 800 pounds per acre at Kizimbani but at Hanyegwa Mchana, where cockchafer grubs caused damage to the roots, the yield was only 132 pounds per acre.

Pigeon peas are an important garden crop in the Protectorate but seldom do well when planted on a large scale.

118. *Pineapples*.—Stock plots were maintained of the varieties Smooth Cayenne and Californian Red.

119. *Rice*.—As usual a considerable part of the experimental programme with food crops was occupied with rice improvement work.

There were two variety trials, one on wet land and one on dry. In each, the three best local varieties Mngazija, Sokotera, and Shingo la Mjane were compared with imported varieties—GEB 24 from Madras and Guiana Criollo and Guiana 79 from Nigeria.

On wet land, GEB 24 gave significantly higher yields than all three Zanzibar varieties while, in the drier land trial, the same variety was better than two local Zanzibar varieties. Yields, on the whole, were poor. The same varieties will be tested again next year: GEB 24 certainly shows considerable promise.

120. At Kizimbani the same three local rices were subjected to renewed selection. Over an acre of each was transplanted with single seedlings and, at harvest time, all plants with eight or more flowering tillers were selected. From these a further selection was made of plants producing $1\frac{1}{2}$ ounces or more of paddy per plant. This seed will be planted for further selection next year.

121. At the Rice Demonstration plot at Kisongoni a combined time of planting and variety trial gave results which indicated that of the four planting dates, 1st January, 15th January, 30th January and 14th February, the second date was the best time and the last date significantly worse than the other three.

Of the varieties Mngazija, Sokotera and Shingo la Mjane, the first gave the best yield at 1,985 pounds of paddy per acre, significantly higher than the others.

122. An interesting feature of the Kisongoni programme was a trial of eight varieties of hill rice from Pemba. These rices are normally very short term and planted when the main rains break. At Kisongoni they proved remarkably drought-resistant, appearing green and broad leaved in February and early March when the surrounding rice areas were dried out. Yields, however, were disappointingly low, the best, *Kijino*, yielding 1,538 pounds paddy per acre as compared with 2,491 pounds per acre of local *Mngazija* in a nearby experimental block. The best will be tested again next year.

Rice crops were planted on several stations in the series of fertiliser trials. At Kisongoni a positive response was observed to compost which presumably increased the water-holding capacity of the soil, whereas sulphate of ammonia, applied at planting time, decreased yield presumably by causing a lush type of growth less capable of resisting the subsequent February and March drought.

Under much wetter and more acid conditions at Mahonda useful responses were obtained to lime and also to humus. Phosphate increased yield, as was expected on *changa* soil, and an unexplained lime-phosphate negative interaction was also observed.

In Pemba, at Ole, where better rainfall was received, nitrogen increased yield and, here again, on acid soil, lime gave a positive response.

In next year's experiments it is intended to withhold the nitrogen dressing until after the drought period and apply when the main rains break. This year's work indicates, however, that rice on acid soil needs lime. Compost also increases yield, in this latter case especially it appears when dry conditions are expected in February and March.

123. *Rozelle hemp*.—Rozelle has been planted twice at Kizimbani but this crop does not yet seem likely to succeed in Zanzibar.

124. *Simsim*.—Simsim is planted by local growers in the coral areas to a limited extent each year and there is undoubtedly considerable scope for developing this crop.

Masika planting at Hanyegwa was a failure but planting with the *mchoo* rains in August gave a fair crop. An imported white variety from Uganda, "Kuman", has also been tried this year but yielded poorly.

125. *Sorghum*.—Dobb's variety of sorghum from Kenya has been planted twice in trials at Kizimbani and is greatly inferior to the local types. The dwarf Hegari variety is most successful at Kizimbani, bearing quite well and maturing early. This variety unfortunately keeps very poorly.

At Hanyegwa Mchana the tall local sorghum was planted in a manurial trial in the fertiliser series. The crop responded very markedly to sulphate of ammonia, to the extent of an extra 300 pounds per acre in a 335-pound crop. There was also a small negative response to the interaction between phosphate and trace elements.

126. *Sunflowers*.—Sunflowers were used at Ole in the *mchoo* rains planting in the fertiliser trials series. The crop was a poor one responding only to lime, as did the previous crop on the same land, rice. The extent of the response was 178 pounds per acre in a 480-pound crop. When the numbers of heads were analysed the only significant response was a negative one to potash.

Sunflowers were also planted in trial plots on several stations and samples of the harvested produce sent to England for examination by the Department of Industrial Chemistry, Liverpool University. The crop did not do really well anywhere this year. At Kizimbani, on well-mucked land, a yield of 736 pounds per acre of the white variety was obtained but black-seeded sunflowers yielded only 388 pounds per acre. On the coral soils at Hanyegwa, without manuring, the yields were only eighty-four and fifty-six pounds respectively. Yields at Ole were midway between these extremes at 455 pounds for the white and 160 pounds for the black.

127. *Sweet potatoes*.—Varieties B 44 and Caroline Lea were maintained at Kizimbani and elsewhere for distribution to the public. A selection of tubers of several varieties was received from Hong Kong and planted at Kizimbani. Some of these have done very well and appear most promising. These are now being multiplied up for a variety trial.

A manurial trial of sweet potatoes, after maize, gave most interesting results at Kizimbani. The average yield of the whole experiment was 7,860 pounds per acre and positive responses were recorded for phosphate, lime and compost to the extent of 1,211, 1,569 and 1,646 pounds per acre respectively. This response to lime was most unexpected. There was also a strong negative response to sulphate of ammonia at 3,499 pounds per acre and a smaller one to the phosphate-compost interaction. The reduced yield caused by nitrogen was also unexpected as these plots looked particularly well. The aerial growth was apparently increased at the expense of the tubers.

128. *Tannia* (*Xanthosoma sagittifolia*).—This crop, which is normally confined to the clove areas, has been planted for trial on coral rag at Muongoni and is growing well. This planting has caused considerable interest on the part of local cultivators.

129. *Tea*.—Seed from Tanganyika has been planted in the nursery at Kizimbani with a view to the establishment of a small trial plot.

130. *Tobacco*.—Tobacco is an important export crop and grown mainly on the coral soils in the east and south of Zanzibar. Under conditions of relatively high fertility large, coarse-leaved plants are produced and these, when dried and plaited, are sold locally for chewing. A good deal goes to Pemba. Under less fertile conditions and from the ratoon crop a smaller, paler leaf is produced and exported to Somalia.

During the year both types of local tobacco have been produced at Hanyegwa and Mkwajuni with a view to familiarising these stations with the crop prior to testing imported superior varieties next year.

At Hanyegwa an acre yielded a total crop of 441 pounds which consisted of 131 pounds of first cut coil for local sale, together with 180 pounds high grade and 130 pounds lower grade for export. At Mkwajuni the yield was 388 pounds per acre of local chewing type coil.

Quality was reduced everywhere this year by *Cercospora* damage and, on the dry coral areas, by lack of oil in the leaf.

131. *Tung*.—Plantings of *Aleurites fordii* and *A. montana* were made at Kizimbani. The former died after establishment in the field but excellent growth has been made by the *montana* plants.

A. moluccana blocks have also made good progress during this, the second field year, but have not yet flowered.

132. *Urena fibre*.—*Urena* from the Belgian Congo is making fair progress in its first planting at Kizimbani but, as yet, no fibre has been produced from this trial plot.

133. *Yams*.—Trial blocks of three local, one Ceylon and one Barbadoes varieties have been established on several stations in Zanzibar.

A fair crop of 3,484 pounds per acre was obtained from local yams on the coral rag at Muongoni.

SECTION II.—VETERINARY AND ANIMAL HUSBANDRY

134. Again contagious ophthalmia was the only epidemic disease which seriously affected the cattle population of the Protectorate. In Pemba the disease assumed serious proportions, while in Zanzibar there were local outbreaks in the neighbourhood of Paje and Makunduchi.

In all 2,665 animals in Pemba and 1,545 in Zanzibar were treated with one per cent silver nitrate solution. Except in cases where the reporting of infection was long delayed this was uniformly successful.

135. Early in the year an organised campaign, with the object of reducing the incidence of trypanosomiasis in Zanzibar Island, was commenced. During the first three months, when the areas tackled were those thought to have the highest incidence, twenty-four per cent of the animals examined were found to be positive for the disease. Later, in the eastern seaboard areas, which are comparatively free from tsetse, the percentage fell to negligible proportions. In all, out of 3,656 animals examined, 294 were found positive for trypanosomiasis. In addition 167 animals were treated at the Veterinary Laboratory at Marhubi.

136. Diagnosis has been by means of a single examination of fresh blood-smears, which cannot of course be relied upon to show up every case, as trypanosomes are not at all times present in the peripheral blood stream. No doubt frequent examinations over a period of time would have revealed an appreciably greater number of positive cases.

137. Treatment with dimidium bromide has given uniformly satisfactory results, few cases of relapse and no cases of photosensitisation being reported.

138. Two officers of the East African Tsetse and Trypanosomiasis Research and Reclamation Organization visited the Protectorate in November with a view to initiating a thorough survey into the life-history and habits of *Glossina austeni*. Large catches of fly were obtained in the Jozani forest area and a full-scale investigation has now been started.

139. During the year the quarantine area was completely fenced and, as an additional precaution against disease introduction, the period of detention was increased from two to three weeks. One death from anthrax occurred, and one hundred contact animals were inoculated with vaccine.

140. The health of the stock at the Mtoni dairies was satisfactory, though many unnecessary deaths of calves were caused by bad management and neglect. The Public Works Department has carried out further improvements especially to the roads.

141. At the Veterinary clinic, 2,923 mammals, including 2,361 bovines, were pathologically examined during the year. Of these 2,422 received treatment. Treatments to all classes of stock in Pemba totalled 771, excluding contagious ophthalmia.

142. Comparative importations from the mainland and elsewhere for the year 1946, 1947, and 1948 were as follows:—

	1946	1947	1948
Oxen	2,177	2,370	1,954
Cows	177	262	157
Calves	72	99	76
Goats	9,490	11,669	10,432
Sheep	1,215	1,664	1,304
Donkeys	46	101	44
Horses	3	3	1

There is little to be gleaned from these figures, which indicate reasonably stable purchasing power.

143. Animals slaughtered at the Zanzibar abattoir during the year were as follows:—

	Cattle	Goats	Sheep
Imported	1,818	8,867	1,232
Local	857	2,939	—
Total	2,675	11,806	1,232

The total figures are almost exactly similar to those for 1947, but slaughtering of local stock have increased substantially.

144. Pemba slaughtering of bovines were as follows:—

	Matangatiwani	Weje/Piki	Ziwani	Chake/Chongo	Mkoani	Total
Districts	282	617	270	873	641	2,713
Townships	—	418	—	396	70	890
Total	282	1,065	270	1,269	717	3,603

These figures are almost exactly the same as in 1946, but well below 1947.

STOCK FARM.

145. *Cattle*.—At the end of the year the cattle at Kizimbani Stock Farm consisted of the following animals:—

Bulls	1
Young bulls	3
Cows	46
Heifers	47
Bull calves	23
Heifer calves	31
Bullocks	50
Total	204

In order to keep numbers within reasonable limits the culling standard for cows was first raised to less than 150 gallons in the second lactation, and subsequently to less than 175 gallons. All culls together with surplus bullocks, were sold off the farm.

146. Alterations were made to the calf pens which allowed for the ingress of considerably more light and air, and towards the end of the year a number of calves were reared in light movable pens, the calf lying directly on the grass with a little bedding.

Cases of suspected "White Scour" have been treated with sulphathiozole, but the use of Colon bacillus vaccine has been discontinued.

As a result of these and other measures there has been an obvious improvement in the general health of the calves and the mortality rate has dropped to 8.5 per cent. As for all practical purposes 5 per cent is an absolute minimum this is very satisfactory.

147. The health of the main herd has been good, the most troublesome complaint being contagious ophthalmia, which was to a greater or lesser degree present in the herd throughout the year. As in the districts, treatment with silver nitrate combined with isolation has kept the disease under a reasonable degree of control.

148. Although the herd is regularly dipped every week the fact that they have to graze off the farm always results in a few cases of tick-borne disease. There were five cases of east coast fever, one of which proved fatal, and two cases of *Anaplasmosis*, again with one fatality.

149. An outbreak of contagious calf pneumonia affected eight calves which were treated with M. & B. 125 and Penicillin. Only one fatality resulted.

150. There were no fatalities from white scour, but three calves died from stomach ulceration caused by hair balls. This latter trouble has been partially overcome by muzzling.

151. Other troubles include two small outbreaks of Cowpox variola, several suspected but unconfirmed cases of mastitis, and some haemonchiasis, though on a much reduced scale. Regular drenching with two per cent copper sulphate or phenothiazine has brought the last named under control.

152. On the average there are two cases of trypanosomiasis a month, easily controlled by dimidium bromide.

153. The bull testing policy was continued, and two bulls, Nos. 141 and 175, each completed fifty services. It has for some time been felt that new blood should be introduced, and towards the end of the year a bull from a similar herd at Laikipia in Kenya was imported. Unfortunately this animal succumbed to digestive troubles mainly occasioned by the sudden change in environment. A further importation will be made.

154. Unfortunately a further number of first lactations by his daughters confirm the poor value of No. 11 as a sire.

155. The monthly milk indices for 1948 are here compared with those for 1947 and with those representing the average for the previous five years. They speak for themselves.

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average	
1942-46	...	6.6	6.3	6.3	5.9	5.7	5.6	5.7	5.5	6.1	6.4	6.8	6.7	6.2
1947	...	5.1	5.1	5.2	5.2	5.6	6.2	6.3	6.5	6.9	7.1	6.8	7.5	6.1
1948	...	7.5	6.7	6.7	6.4	7.4	7.5	7.2	7.1	6.8	6.4	6.6	7.0	6.9

156. Appendix X gives comparative figures for milk production for the past seven years calculated according to the method recommended for universal adoption at a discussion on animal genetics by the Commonwealth Plant Breeding Conference at Cambridge.

It is obvious that continuous, if fluctuating, progress has been made, and although much of this has undoubtedly been due to feeding and management, selection must have also played its part.

157. The best lactation of the year was 4,059 pounds by cow No. 42, with a milk index of 13.8. Two cows gave over 3,000 pounds, and five others over 2,500 pounds.

158. *Pasture improvement*.—In a further effort to control the all-too-prolific weed growth two experiments with hormone weed-killers were carried out during the year.

In the first the following products were employed:—

- (1) Agroxone powder five per cent at 120 pounds per acre.
- (2) Agroxone liquid at six litres per hectare.
- (3) Chloroxone (24-D) one per cent at 400 pounds per acre.

159. Trials were conducted on two dates, on the 25th March, prior to the onset of the main rains, when conditions were dry and hot, and on the 17th July, when low temperatures accompanied by occasional light shower prevail. Within a few days of the application a considerable degree of wilting occurred, but within two or three weeks the bulk of the plants had recovered.

160. The following gives the results in more detail:—

Species killed.—*Dolichos hosei*.

Species badly affected but recovered—

Stachytarpheta angustifolia.

Sida sp. near *S. rhombifolia*.

Species slightly affected and recovered—

Tephrosia noctiflora.

Dissotis rotundifolia.

Hydrocotyle asiatica.

Triumfetta rhomboidea.

Species unaffected—

Euphorbia hirta.

Commelina benghalensis.

Thunbergia alata.

Cyperus rotundus.

Dolichos hosei unfortunately happens to be a valuable pasture legume.

161. It can be tentatively concluded that, although the hormone weed killers have some positive action, it would probably be necessary to use uneconomical quantities at high concentration to have any permanently useful effect. The hormones are probably better adapted to the control of a specific weed in a specific crop than to general control of perennial weeds under tropical conditions.

162. Subsequent experiments with Fernoxone at one per cent, two per cent, and four per cent strength gave similar results.

163. The one-acre plots of *Paspalum notatum*, *Panicum trichocladum*, *Melinis minutiflora*, and a local *Digitaria*, indicate that only the local *Digitaria* seems able to persist as a pasture grass and may be of economic importance. *Panicum trichocladum* though it makes good growth in the early stages and is very palatable, soon becomes choked with weeds. *Melinis minutiflora* is more suitable for cutting.

164. Among grasses which have only as yet been tried on a small scale *Chloris gayana* (Rhodes grass) seems the most promising.

Panicum maximum (Guinea grass) and *Pennisetum purpureum* (Elephant grass) were both grown and cut for fodder, but, although they produced reasonable yields they recovered badly and were wasteful in feeding. Neither of them seems likely to have the same general utility as a cut fodder as Kudzu (*Pueraria phaseoloides*).

165. *Goats*.—Both local and Tanganyika goats continued to do badly and it was eventually decided to dispose of the herd and make a fresh start with very carefully selected local goats of Indian origin.

166. *Sheep*.—The small herd of Somalia sheep thrived and bred regularly. The only trouble encountered was a small outbreak of foot rot. It is thought that they would be likely to be most suitable for the open coral rag country.

EDUCATION

167. *Young Farmers Course*.—The year was signalised by the first "Young Farmers" course for which provision had been made under the Colonial Development and Welfare grant for agricultural development. By arrangement with the Director of Education five places in the course were filled by teachers, the object being to provide them with sufficient agricultural and gardening knowledge to enable them to supervise school gardens with interest and intelligence. Difficulty was encountered in filling the seven remaining places for "Young Farmers", and some of the entrants were undoubtedly too young, being only seventeen or eighteen years of age, but in the end three young men from Zanzibar and four from Pemba settled down and completed the course.

168. So far as the teachers were concerned the course was a complete success, but the "Young Farmers" as a whole displayed regrettably little enthusiasm and disliked the practical nature of the teaching.

169. *Pupils-in-Training*.—Three of the five pupils who had completed their second year in 1947 were considered to be below standard and were given a year's work in the districts in 1948 in order to give them an opportunity of proving their worth before being admitted to a possible third year. Of those three two were ultimately considered suitable for further training. The two who were considered up to standard at the end of their second year completed their third year satisfactorily.

Two further pupils completed their first year's training in 1948.

170. During the year, in consultation with the Director of Education, and with the agreement of His Highness' Government, it was decided to raise the educational qualifications necessary for entrance to the course to Standard XII.

171. *Rural Middle School Boys*.—Seventy-two boys from the Rural Middle School, divided into four classes, attended a lecture at Kizimbani on one morning each week, and then spent the rest of the morning in practical work.

The mornings selected for this were Monday to Thursday inclusive, the routine adopted being that on the Monday the member of the Agricultural Department's staff concerned lectured himself to the first class, the lecture being repeated on Tuesday, Wednesday, and Thursday by the Education Department's teachers in charge of the course.

172. Lectures were given on the "General Principles of Agriculture", the "Zanzibar Crops", and "Animal Husbandry", with practical work concerning all three subjects. As in 1947 the course was a great success, keen interest being displayed by the boys.

173. The Kichwele Small Holders completed their first year on the holdings at Kichwele, and the ten remaining appear to be satisfied and to have worked hard.

PRODUCE INSPECTION

174. The Inspector of Produce returned from leave on the 26th January, and resumed charge of the section.

175. The quantities of cloves passed for export, under the Agricultural Produce (Export) Decree, are shown below in their respective grades:—

Month	Grade II	Grade III	Total passed
January	1,887	751	2,638
February	8,027	—	8,027
March	14,927	—	14,927
April	11,131	305	11,436
May	3,299	—	3,299
June	45,649	100	45,749
July	19,440	—	19,440
August	3,327	60	3,387
September	3,014	525	3,539
October	10,129	—	10,129
November	20,897	518	21,415
December	14,312	1,590	15,902
	156,039	3,849	159,888

All cloves were packed in the Inspection Shed. The percentage of Grade III was only 2.4 as compared with 3.9 in 1947.

176. The results of the examination of cloves and clove stems under the Adulteration of Produce Decree were as follows:—

CLOVES IN BAGS			FAILED FOR		
Origin	Total deliveries	Passed	Excessive moisture	Extraneous matter	Percentage failure
Zanzibar	... 24,687	21,911	2,709	67	11
Pemba	... 126,295	118,608	7,029	658	6
	150,982	140,519	9,738	725	7

CLOVE STEMS IN BAGS			FAILED FOR		
Origin	Total deliveries	Passed	Excessive moisture	Extraneous matter	Percentage failure
Zanzibar	... 8,077	7,816	176	85	3
Pemba	... 51,853	48,169	3,684		5
	59,930	55,985	3,945		4

177. The following are details of the bags of copra which passed through the Zanzibar market during the year and were examined for adulteration.

COPRA IN BAGS			FAILED FOR		
Origin	Total deliveries	Passed	Excessive moisture	Extraneous matter	Percentage failure
Zanzibar	... 152,996	146,174	6,160	662	4
Pemba	... 36,412	36,217	55	140	1
	189,408	182,391	6,215	802	4

This only represents a portion of the copra made in the Protectorate as it is not compulsory for it to pass through the market.

There were definite signs of improvement in quality, due in part, no doubt, to the kiln improvement campaign.

178. As from the 1st October, 1948, coconut oil was brought under the Agricultural Produce (Export) Decree, standards being fixed and inspection before export being made compulsory.

Comparative exports are as follows:—

				lb.
1946	...	...	...	1,357,641
1947	...	...	...	2,344,945
1948	...	...	...	7,077,816

179. Two thousand three hundred and twenty-four tons of mangrove bark and sixteen tons of chillies were passed as fit for export. The cutting of mangrove bark has now been suspended for an indefinite period.

180. Comparative produce arrivals for the year 1944 to 1947 were as follows:—

Produce	1944 Bags	1945 Bags	1946 Bags	1947 Bags	1948 Bags
Zanzibar cloves	... 60,305	25,879	18,680	41,107	24,687
Pemba cloves	... 169,203	76,916	197,100	171,912	126,295
Zanzibar copra	... 174,782	159,634	159,315	131,872	152,996
Pemba copra	... 63,864	62,894	47,591	48,953	36,412
Zanzibar stems	... 17,327	16,199	4,082	28,839	8,077
Pemba stems (Pemba Inspection figures)	... 103,520	46,328	56,081	128,033	59,930

CHEMICAL LABORATORY

181. Comparative figures of the number of routine samples examined during the past ten years are as follows:—

Year	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
Number of samples	413	391	1,085	2,458	1,779	1,338	931	975	933	1,185

Of the 1,185 samples examined during the year, 1,169 came from Government departments and sixteen from private firms. This is much the same as in 1947. The gross increase is almost entirely due to coconut oil samples from the Inspector of Produce.

Fees during the year, excluding those paid for the examination of coconut oil, totalled Shs. 278 as against Shs. 285 in 1947. Those in respect of coconut oil were Shs. 8,995.

182. Details of Government samples are as follows:—

Agriculture	...	Clove oil, 78; Cattle dip, 125; Water, 7; Coconut oil, 553; Copra, 40; Cloves, 3; Fertilisers, 16; Cattle foods, 5; Clove still residues, 4; Chillies, 1; Mangrove bark, 2; Insecticide, 1; Coconut oil residue, 1; Washing soda, 1; Cocoa leaves, 2.
Health Office	...	Milk, 220; Fruit juices, 10; Liver salt, 3; Coconut oil, 1.
Police	...	Bhang, 35; Native liquor, 3; Rubber solution, 2; Smoking apparatus, 1.
Customs	...	Methylated spirits, 4; Vinegar, 5; Perfumes, 2.
Medical	...	Vomit, 2.
Public Works Department	Water, 27; Salt and brine, 5; Lubricating oil, 3; Soils, 3; Scale, 2; Piping, 1; Cistern float, 1.	

183. *Agriculture*.—Clove oil samples have maintained a satisfactory eugenol content throughout the year. The arsenic content of all cattle dips analysed has been within allowable limits.

Coconut oil samples received have improved in quality, those failing to reach the required standard being 19, 2, 2, and 4 per cent in the corresponding quarters of the year. In order to encourage millers to have their oil analysed fees have been reduced from Shs. 11.25 to Shs. 5 per sample.

184. *Health*.—Of the milk samples examined approximately 16 per cent were found to contain added water, almost exactly the same figure as for 1947.

The adulteration rate quarter by quarter was as follows:—

	First	Second	Third	Fourth
Percentage	9	26	15	16

Most of the convictions obtained were for comparatively small amounts of added water.

185. *Investigational work*.—A number of local leaf vegetables were examined for iron and copper content in connection with the prevalence of anæmia among Africans. Copper content was found to lie within the normal range and iron content was in general very good indeed.

186. At the request of a local miller sludge from his coconut oil settling tanks was examined, and had the following composition:—

	Percentage
Oil	54.5
Free fatty acids	19.8
Insoluble matter	24.8
Moisture	0.9

This was mixed with soft wood sawdust, one per cent crude salt, and a trace of aniseed to make a palatable and apparently harmless cattle food. It is, however, very doubtful if it would be economic on a commercial scale.

187. Samples of eugenol were prepared from clove oil and sent to the Imperial Institute for examination.

188. Soil samples from all the areas in which cocoa has been planted were collected during the year and analysed for the more important nutrient elements. Though it is obvious that some areas are definitely unsuitable it has not been possible to define at all clearly the relation between cocoa productivity and soil composition.

189. The possibility of minor element deficiencies, which first suggested itself in connection with unthriftness in cocoa, has received attention. Using the Roach technique a marked response to copper was obtained to leaf injections at Kizimbani. Branch injection of copper was defeated by gum exudation and the application of copper sulphate to the soil produced no effect.

190. The condition of chlorotic seedlings of cashew and wattle on shallow humic soils over limestone has been ameliorated, at least temporarily, by the application of iron. The methods adopted were the nicking of the leaf surface and rubbing in the solid, and the spraying of the leaf with a solution of the chemical in a weak starch paste.

191. Another approach has been the growing of plants which are known to be especially sensitive to various deficiencies in pots containing different soil types. Three of the seven most important soil types of the island have shown what appear to be characteristic symptoms of iron deficiency.

192. In the field of soil analysis Morgan's rapid semi-quantitative technique has been applied to the microplots used for testing the major element requirements of various soils. The average results for each soil type, expressed as approximate parts per million of element extractable by Morgan's reagent are as follows:—

<i>Kinongo group</i>	NO_3/N	NH_3/N	<i>P</i>	<i>K</i>	<i>Ca</i>	<i>Mg</i>	<i>Al</i>	<i>Mn</i>	<i>Fe</i>
Deeper Kinongo ...	5	(45)	8	26	2,900	101	14	4	2
Semi-wanda ...	2	4	5	12	3,500	101	33	4	2
Shell Sand ...	7	3	9	15	11,000	227	4	0.3	2
<i>Changa group</i>	NO_3/N	NH_3/N	<i>P</i>	<i>K</i>	<i>Ca</i>	<i>Mg</i>	<i>Al</i>	<i>Mn</i>	<i>Fe</i>
Red Changa ...	4	5	2	44	1,200	37	31	37	3
Brown Changa ...	2	5	3	76	1,200	56	17	26	2
Grey Changa ...	7	(112)	4	221	1,200	40	43	23	4
Sandy Changa ...	2	6	3	16	900	35	13	4	4

The results agree fairly well with the result of the microplot experiments which indicate that the *Kinongo* group respond to nitrogen and potash, whereas the *Changa* soils respond to nitrogen and phosphate, and in some cases lime.

Possible critical minima for maize, the crop used in the microplots, are nitrate nitrogen 10, phosphorus 5, potassium 25, and calcium 1,000. In the case of aluminium, an undesirable constituent reflecting high acid values, the possible critical maximum is about 40. The rather low magnesium figure in the red *Changa* type is of interest in connection with cocoa leaf analyses to which reference is made in the next paragraph.

193. Samples of young, mature, and old cocoa leaves were collected from both thrifty and unthrifty areas on the same day. The first series was collected from unthrifty plots at Kizimbani and from a flourishing plot at Selem. A second series at a later date was taken from thrifty and unthrifty plots at Kizimbani, from healthy plants budded on a hardy rootstock, and from old and flourishing trees at Dunga.

194. There were marked differences in the phosphate content of young leaves, though that of old leaves was almost constant.

The normal relationship of leaf composition to age in flourishing cocoa shows two trends, one set of nutrients, magnesium and manganese, increasing with age, and nitrogen, phosphorus, potassium, and iron decreasing. The most interesting result of these analyses is that the magnesium content of the most unthrifty samples did not increase with age, thus suggesting a magnesium deficiency. The unthrifty plants also show a high potassium content, as if the plants were in this way attempting to compensate for the magnesium deficiency.

SECTION III.—LEGISLATION

195. The following legislation was enacted during the year:—

			<i>Date</i>
Government Notice No.	1	The Defence (Preparation of Rice Land (Pemba) Order, 1948	3— 1—48
„	No. 5	Appointment of Inspector under the Adulteration of Produce Decree (Cap. 120) ...	17— 1—48
„	No. 26	The Agricultural Produce (Amendment) Rules, 1948	13— 3—48
„	No. 44	The Diseases of Animals (Declaration of Diseases) Order, 1948	10— 4—48
General Notice	No. 303	Declaration of Infected Area under the Diseases of Animals Decree (Cap. 128) ...	8— 4—48
Government Notice No.	50	Application of Rule 13 of the Diseases of Animals Rules, 1923, to Mtoni and Marhubi Government shambas	1— 5—48
„	No. 52	Declaration of Coconut Oil to be produce under the Adulteration of Produce Decree (Cap. 120)	8— 5—48
„	No. 53	Declaration of Coconut Oil to be produce under the Agricultural Produce Export Decree (Cap. 116)	8— 5—48
„	No. 72	The Defence (Planting of Cassava) (Pemba) Order, 1948	12— 6—48
„	No. 74	The Defence (Planting of Pulses and Sweet Potatoes) (Pemba) Order, 1948	19— 6—48
„	No. 77	The Plantation Workers (Clove-picking Contracts) Regulations, 1948, under the Labour Decree No. 11 of 1946	3— 7—48
„	No. 81	The Diseases of Animals (Amendment) Rules, 1948	10— 7—48
„	No. 82	Application of Rule 13 of the Diseases of Animals Rules, 1923, to the Government Dip at Mtoni in the District of Zanzibar	10— 7—48
General Notice	No. 718	Declaration of Infected Area under the Diseases of Animals Decree (Cap. 128) ...	19— 7—48
Decree	No. 15	The Fish Protection Decree, 1948	21— 8—48
General Notice	No. 842	Declaration of Infected Area under the Diseases of Animals Decree (Cap. 128) ...	3— 9—48
Government Notice No.	110	The Agricultural Produce Export (Coconut Oil) Rules, 1948	18— 9—48
„	No. 122	The Minimum Wage (Produce Packing and Bagging) Order, 1948, under the Minimum Wages Decree No. 1 of 1935 ...	16—10—48
„	No. 132	The Defence (Planting of Cassava) (Zanzibar) Order, 1948	13—11—48
„	No. 140	The Defence (Preparation of Rice Land) (Zanzibar) Order, 1948	27—11—48
Decree	No. 25	The Clove Growers Association (Amendment) Decree, 1948	18—12—48
Government Notice No.	160	The Clove Grading and Export (Amendment) Rules, 1948	18—12—48
„	No. 165	The Clove (Licences) (Amendment) Rules, 1948	18—12—48
„	No. 168	The Woodcutting (Fees and Royalties) (Amendment) Order, 1948	18—12—48
„	No. 175	The Clove (Minimum Percentage of Exported Cloves) Order, 1948	24—12—48
„	No. 176	Prices for the Purchase of Cloves	24—12—48
Decree	No. 1	The Acquisition of Land (Assessment of Compensation) Decree, 1948	1— 4—49
„	No. 2	The Land Acquisition (Amendment) Decree, 1948	1— 4—49
„	No. 7	The Co-operative Societies Decree, 1948	
„	No. 22	The Animal Diseases Decree, 1948	

196. *Government Notices Nos. 1, 72, 74, 132 and 140* relate to cultivation and planting orders made under the Defence (Land Requisition and Personal Service) Regulations, 1943, with the object of maintaining the production of locally grown foodstuffs.

197. *Government Notice No. 5.*—This notice made under the Adulteration of Produce Decree (Cap. 120) appoints an Inspector to facilitate working of the Decree in the Island of Pemba.

198. *Government Notice No. 26.*—The object of this notice made under the Agricultural Produce Decree No. 13 of 1937 is to revert to a system whereby permits for the removal of agricultural produce in terms of Section 11 of the Decree must be produced for examination on demand rather than at specified Police Posts which restricts movement of constables.

199. *Government Notice No. 44.*—By this notice made under the Diseases of Animals Decree (Cap. 128) conjunctivitis, in order to facilitate its control, is declared to be a disease.

200. *General Notice No. 303.*—By this notice certain Shehias in the Mudiria of Makunduchi in Zanzibar Island are declared to be an infected area as regards conjunctivitis; and movement of cattle, sheep, goats, mules and donkeys into, within and out of these areas without the authority of the authorised officer is prohibited.

201. *Government Notice No. 50.*—This notice made under the Diseases of Animals Decree (Cap. 128) makes dipping of cattle in the Government Shambas of Mtoni and Marhubi in the District of Zanzibar compulsory.

202. *Government Notice No. 52.*—By this notice coconut oil is declared to be produce for purposes of the Adulteration of Produce Decree (Cap. 120).

203. *Government Notice No. 53.*—By this notice coconut oil is declared to be produce for purposes of the Agricultural Produce Export Decree (Cap. 116).

204. *Government Notice No. 77.*—These regulations made under the Labour Decree No. 11 of 1946 prescribe a standard contract for clove-pickers for the clove harvest season from 1st July, 1948, to 30th June, 1949.

205. *Government Notice No. 81.*—These rules made under the Diseases of Animal Decree (Cap. 128) lay down the fees to be charged for dipping of cattle at approved Government dips.

206. *Government Notice No. 82.*—By this notice the fees laid down under Government Notice No. 81 are made applicable to the Government Dip at Mtoni in the District of Zanzibar.

207. *General Notice No. 718.*—This notice declares the Island of Pemba to be an infected area as regards conjunctivitis and prohibits movement of cattle as in General Notice No. 303.

208. *Decree No. 15.*—The object of this Decree is to make provision for controlling the fishing industry and protecting and improving the fisheries in the waters surrounding the Protectorate. This Decree has not yet come into force.

209. *General Notice No. 842.*—This notice revokes General Notice No. 303 and whilst declaring the same shehias as infected area prohibits the movement of cattle only.

210. *Government Notice No. 110.*—These rules made under the Agricultural Produce Export Decree (Cap. 116) provide for the inspection and grading of coconut oil prior to export.

211. *Government Notice No. 122.*—This order made under the Minimum Wages Decree No. 1 of 1935 lays down the Minimum rates of pay per day or night payable for produce packing and bagging.

212. *Decree No. 25.*—Amends the Clove Growers Association Decree (Cap. 118) in several respects.

213. *Government Notice No. 160.*—This notice made under the Agricultural Produce Decree (Cap. 116) raises the fee for inspecting, grading and branding of a bale or package of cloves from ten to fifteen cents of a shilling as from 1st January, 1949.

214. *Government Notice No. 165.*—This notice made under the Clove Decree No. 9 of 1938 increases the fee for a clove exporter's licence from Shs. 5 to Shs. 100 as from 1st January, 1949.

215. *Government Notice No. 168.*—This notice made under the Wood-cutting Decree No. 18 of 1945 increases the fee for a permit to cut wood from five cents to one shilling.

216. *Government Notice No. 175.*—This order provided that, with effect from the 1st March, 1949, of every 100 pounds of cloves exported from the Protectorate fifteen pounds must be cloves purchased from the Clove Growers Association.

217. *Government Notice No. 176.*—This order under the Clove Growers Association Decree (Cap. 118) fixes the prices for the purchase of cloves and clove-stems by the Association for the period 1st January, 1949, to 30th June, 1949.

218. *Decree No. 1.*—The main purpose of this Decree is to transfer the authority for assessing compensation, in respect of land acquired compulsorily under the Land Acquisition Decree (Cap. 105) and the Town Planning Decree (Cap. 101), from the District Commissioner to Compensation Boards.

219. *Decree No. 2.*—Amends the Land Alienation Decree (Cap. 105) consequential upon the passing of the Acquisition of Land (Assessment of Compensation) Decree No. 1 of 1948.

220. *Decree No. 7.*—This Decree provides for the formation and registration of co-operative societies and the regulating of their affairs. The object of this Decree is to encourage the extension and development of the co-operative movement in the Protectorate.

221. *Decree No. 22.*—This Decree replaces the Diseases of Animals Decree (Cap. 128) which is no longer adequate to ensure the effective control and prevention of disease. This Decree has not yet become law.

STAFF AND GENERAL

The staff position did slightly improve during the year, and this, coupled with the hard work of all concerned, has enabled a very considerable measure of progress to be achieved. It is hoped that the end of 1949 will see the major portion of the capital work connected with the development programme completed, thus releasing energies for the application to the farming communities of the lessons learnt from experimental work.

It is only fitting that a tribute should be paid to Mr. F. B. Wilson, transferred to Kenya in March, whose knowledge of the people and farming methods of the Protectorate would be hard to equal.

O. S. SWAINSON,
Director of Agriculture

Appendix I

STATEMENT OF REVENUE AND EXPENDITURE OF
GOVERNMENT PLANTATIONS

REVENUE

				Shs.	Cts.	Shs.	Cts.
Cloves	...	...	...	11,105	71		
Coconuts	...	...	...	173,694	25		
Miscellaneous	...	...	...	10,529	72		
Leased Plantations	...	...	...	1,200	00		
Hire of lorry	...	...	...	1,207	30		
House rent	...	...	...	277	35		
				198,014	33		
<i>Less</i> value of Produce brought over from 1947				25,962	94		
				172,051	39		
<i>Add</i> value of Produce carried over to 1949				86,538	25	258,589	64

EXPENDITURE

Personal Emoluments	35,602	27		
Other Charges	200,649	38	236,251	65
Revenue exceeds Expenditure by Shs. 22,337 99				

Appendix II

REVENUE AND EXPENDITURE OF GOVERNMENT PLANTATIONS

REVENUE

	<i>Kidichi</i>		<i>Seleḿ</i>		<i>Mtoni</i>		<i>Chukwani</i>		<i>Total</i>	
	Shs.	Cts.	Shs.	Cts.	Shs.	Cts.	Shs.	Cts.	Shs.	Cts.
Sale of :										
Cloves & stems	7,916	16	3,189	55	...	...	...	...	11,105	71
Copra	74,855	30	18,667	90	31,551	56	21,145	09	146,219	85
Coconuts	14,070	87	3,148	32	4,035	51	2,124	70	23,379	40
Coconut crops	...	...	296	00	2,602	00	1,197	00	4,095	00
Miscellaneous	3,792	25	2,096	45	4,487	33	153	69	10,529	72
Hire of lorry	566	30	218	30	206	00	216	70	1,207	30
Leased plantation	...	...	1,200	00	...	...	...	...	1,200	00
House rent	164	74	71	34	38	29	2	98	277	35
	101,365	62	28,887	86	42,920	69	24,840	16	198,014	33
<i>Less</i> value of produce brought forward:-	14,031	40	3,835	02	4,999	30	3,097	22	25,962	94
	87,334	22	25,052	84	37,921	39	21,742	94	172,051	39
<i>Add</i> value of produce carried forward :-										
Cloves & stems	586	64	...	...	...	...	...	...	586	64
Copra	41,274	09	10,030	48	13,315	39	5,756	86	70,376	82
Coconuts at Shs 110/- per 1,000	1,540	77	...	...	9,634	02	4,400	00	15,574	79
Total Revenue	130,735	72	35,083	32	60,870	80	31,899	80	258,589	64

EXPENDITURE

Personal emoluments	5,312	25	2,883	13	2,047	47	943	00	11,185	85
Transport expenses	1,446	11	736	39	343	48	390	80	2,916	78
Materials and tools	1,157	05	807	37	268	54	150	88	2,383	84
Labour	95,543	79	28,772	64	31,137	35	25,631	42	181,085	20
Repairs to buildings	4,404	03	2,953	39	1,838	65	1,187	80	10,383	87
Fuel and maintenance of lorry	1,226	00	472	50	445	50	469	32	2,613	32
Storage of copra	696	87	159	00	253	70	156	80	1,266	37
Total expenditure	109,786	10	36,784	42	36,334	69	28,930	02	211,835	23
Profit	20,949	62	...	...	24,536	11	2,969	78	48,455	51
Loss	...	...	1,701	10	...	...	...	...	1,701	10
					NETT GAIN		Shs.		46,754	41

Appendix III

DISTRIBUTION OF PLANTING MATERIAL — FOODSTUFFS

		<i>Zanzibar Station Including Kizimbani</i>	<i>Pemba Station</i>	<i>Total</i>
Cassava cuttings	Nos.	95,750	3,400,000	3,495,750
Sweet Potato slips	"	33,750	63,000	96,750
Rice seed	lb.	2,939	16,019	18,958
Dwarf mtama seed	"	613	...	613
Pulses	"	...	105	105
Maize seed	"	609	90	699
Groundnut	"	417	280	697
Bambarra groundnut	"	55	...	55
Tannia suckers	Nos.	4,000	4,000	8,000
Banana suckers	"	...	210	210
Rice seedlings	"	...	220,000	220,000
Cowpeas	lb.	1,851	...	1,851
Yams	"	829	...	829

Appendix IV

DOMESTIC EXPORTS, 1948

<i>Items</i>	<i>Unit of Quantity</i>	<i>Quantity</i>	<i>Value</i>	<i>Percent of Total value</i>
Cloves	Cental of 100 lb.	289,261	1,000,404	70.04
Clove bud and stem oil	lb.	333,956	70,696	4.95
Copra	ton.	702	27,242	1.91
Coconuts	cwt.	945	366	0.03
Oil Cake	"	35,766	38,023	2.66
Coconut Oil	"	63,228	175,853	12.31
Soap, common and toilet	"	10,843	37,279	2.61
Mangrove bark	ton.	2,295	24,418	1.71
Chillies	cwt.	347	1,631	0.11
Fruit, fresh	"	9,941	6,009	0.42
Beche de mer	"	829	2,830	0.20
Tobacco, unmanufactured	lb.	129,261	3,232	0.23
Hides	cwt.	819	3,252	0.23
Skins, sheep and goat	"	288	1,939	0.14
Livestock	no.	483	50	0.00
Forest Products	value	...	4,321	0.30
Kapok	cwt.	619	3,542	0.25
Fibres, unmanufactured	ton.	4	103	0.00
Shells, marine	cwt.	2,974	7,430	0.52
Rope, cordage and twine	"	2,315	5,916	0.41
Other unclassified natural products	value	...	13,839	0.97
			1,428,375	100.00

Appendix V

DISTRIBUTION OF PLANTING MATERIAL—FRUIT AND MISCELLANEOUS

		<i>Kizimbari</i>	<i>Pemba</i>	<i>Total</i>
Budded orange	Nos.	2,003	503	2,506
„ grapefruit	„	188	23	211
„ mandarin	„	96	...	96
„ pomelo	„	165	...	165
Marcotted litchi	„	44	20	64
„ sapodilla	„	3	...	3
Sapodilla seedlings	„	173	99	272
Avocado pear	„	58	80	138
Mango seedlings	„	159	128	287
Durian seedlings	„	61	12	73
Coffee „	„	223	1,338	1,561
Lime „	„	256	10	266
Cashew „	„	...	129	129
Nutmeg „	„	143	100	243
Chinese guava seedlings	„	102	29	131
Eugenia javanica seedlings	„	48	...	48
Lemon seedlings	„	64	...	64
Mandarin seedlings	„	...	18	18
Jack fruit seedlings	„	2	1,509	1,511
Carambola „	„	7	...	7
Star apple „	„	...	17	17
Sweet lemon „	„	2	...	2
Kudzu (<i>Pueraria phaseoloides</i>) seed	lb.	44	...	44
Pawpaw seed	„	7	...	7
Centrosema seed	„	10	...	10
Crotalaria seed	„	100	...	100
Calopogonium seed	„	5	...	5
Mucuna seed	„	3	...	3
Pineapple suckers	Nos.	700	...	700
Sunflower seed	lb.	860	...	860
Breadfruit suckers	Nos.	...	159	159
Eugenia aquea seedlings	„	...	84	84
Rambutan seedlings	„	...	16	16
Chillie seedlings	„	168,690	25,548	194,238
Guava seedlings	„	...	5	5
Pomegranate seedlings	„	...	4	4
Soursop seedlings	„	...	30	30
Mangosteen seedlings	„	...	6	6
Pawpaw seedlings	„	...	20	20

Appendix VI

FERTILISER TRIALS RESULTS

All designs in this series were factorial, 2⁵, with no replications.

$$** = P = 0.01 \quad * = P = 0.05$$

A. KIZIMBANI EXPERIMENT STATION

All manures, except lime, re-applied for 2nd crop.

<i>Effects, etc.</i>	<i>Dressings per acre</i>	<i>Responses lb./acre</i>	
		<i>Season:</i>	
		<i>Masika (April)</i>	<i>Mchoo (August)</i>
<i>Crop:</i>		<i>Maize</i>	<i>Sweet Potatoes</i>
N	S/ammonia, 3 cwt.	311**	-3,499**
P	Sodaphosphate, 3 cwt.	266**	1,211*
N × P	Interaction	-4	-559
K	S/Potash, 3 cwt.	64	814
N × K	Interaction	19	694
P × K	"	-56	514
H	Compost, 5 tons	281**	1,569**
N × H	Interaction	86	4
P × H	"	-34	-281
K × H	"	64	266
L	to pH = 6.5	-4	1,646**
N × L	Interaction	26	-889
P × L	"	-4	-1,219
K × L	"	49	349
H × L	"	116	-731
Mean Yield		1,161	7,860

B. HANYEGWA MCHANA SUB-STATION

Manures re-applied for the mchoo crop of cowpeas after sorghum but not after maize.

<i>Effects, etc.</i>	<i>Dressings per acre</i>	<i>Responses lb./acre</i>			
		<i>Masika</i>	<i>Mchoo</i>	<i>Masika</i>	<i>Mchoo</i>
		<i>Maize</i>	<i>Cowpeas</i>	<i>Sorghum</i>	<i>Cowpeas</i>
<i>Crop:</i>					
N	S/ammonia, 3 cwt.	322**	12	300**	46
P	Sodaphosphate, 3 cwt.	3	-4	31	6
N × P	Interaction	22	-2	-9	16
K	S/Potash, 3 cwt.	-34	20	-3	7
N × K	Interaction	-47	6	-31	-2
P × K	"	22	-7	13	-41
H	Compost, 5 tons	153*	43**	72	62*
N × H	Interaction	16	16	-57	9
P × H	"	72	-12	25	-51
K × H	"	59	-10	61	-24
E	Minor Elements, 60 lb. mixture	-9	32*	-10	32
N × E	Interaction	-22	-13	10	10
P × E	"	47	6	-93*	-24
K × E	"	9	10	-34	9
H × E	"	-28	2	15	-21
Mean Yield		884	124	335	189

C. KISÓNGONI RICE DEMONSTRATION PLOT

Manures, except lime, re-applied for 2nd crop.

<i>Effects, etc.</i> <i>Season:</i> <i>Crop:</i>	<i>Dressings per acre</i>	<i>Responses lb./acre</i>		
		<i>Masika</i> <i>Rice</i>	<i>Masika</i> <i>Rice</i>	<i>Mchoo</i> <i>Cowpeas</i>
N	S/ammonia, 3 cwt.	-256*	231	-7
P	Sodaphosphate, 3 cwt.	213	463	11
N × P	Interaction	88	431	-47*
K	S/Potash, 3 cwt.	-13	-56	-27
N × K	Interaction	188	150	-31
P × K	"	-6	-206	36
H	Compost, 5 tons	256*	650*	-16
N × H	Interaction	194	-119	34
P × H	"	-350*	-100	-27
K × H	"	150	-81	-16
L	to pH = 6.5	-231	-138	41
N × L	Interaction	244	-44	26
P × L	"	-124	-238	22
K × L	"	-188	-131	0
H × L	"	81	50	21
Mean Yield		2,491	2,281	75

N.B. The cowpea crop was badly damaged by insects.

D. MAHONDA RICE PLOT

All manures, except lime, re-applied for 2nd crop.

<i>Effects, etc.</i> <i>Season:</i> <i>Crop:</i>	<i>Dressings per acre</i>	<i>Responses lb./acre</i>		
		<i>Masika</i> <i>Rice</i>	<i>Masika</i> <i>Rice</i>	<i>Mchoo</i> <i>Cowpeas</i>
N	S/ammonia, 3 cwt.	247	16	28
P	Sodaphosphate, 3 cwt.	278*	103	116**
N × P	Interaction	172	172	9
K	S/Potash, 3 cwt.	-109	191	41
N × K	Interaction	-91	-3	9
P × K	"	-247	-22	22
H	Compost, 5 tons	278*	628**	172**
N × H	Interaction	-166	-66	41
P × H	"	141	-122	-97**
K × H	"	116	-122	53
L	to pH = 6.5	478**	409*	9
N × L	Interaction	-41	141	-9
P × L	"	-9	-516**	-59
K × L	"	41	234	16
H × L	"	-97	-278	-53
Mean Yield		2,045	2,152	286

E. PEMBA STATIONS

Manures not re-applied for 2nd crop.

Effects, etc. Station: Season: Crop:	Dressings per acre	Responses lb./acre			
		Ole	Ole	Ole	Matangatrani
		Masika	Mchoo	Mchoo	Masika
		Rice	Sunflowers	Sunflowers	Maize
			(No. of Heads)		
N	S/ammonia, 6 cwt.	372**	53	2,850	522**
P	Sodaphospate, 6 cwt.	66	70	2,675	484**
N × P	Interaction	9	-14	1,250	147
K	S/Potash, 6 cwt.	-22	-54	4,950*	-41
N × K	Interaction	-28	66	1,875	-153
P × K	"	-34	19	600	9
H	Compost, 10 tons	28	178***	1,325	334*
N × H	Interaction	9	45	1,950	59
P × H	"	-47	-43	2,625	-166
K × H	"	-84	85	3,650	9
L	Lime, 4 tons	466**	-13	2,325	-78
N × L	Interaction	-116	-46	650	-266*
P × L	"	3	-10	1,575	9
K × L	"	41	51	3,050	97
H × L	"	-59	75	2,525	-41
Mean Yield		933	480	11,013	736

YIELDS OF MATURE CACAO TREES Appendix VII

(A) JAVA CRIOLLO (DUNGA) 54 TREES

	Number of pods harvested			
	1945	1946	1947	1948
January	Not picked	298	255	62
February	"	26	49	31
March	"	29	...	26
April	"	29	...	12
May	"	94	65	...
June	"	4	50	6
July	"	...	...	9
August	17	...	...	...
September	14	...	...	12
October	13	148	17	101
November	47	150	314	231
December	59	976	125	252
Total	150	1,754	875	742

(B) FORASTERO (KINUNI MOSHI) 8 TREES

Tree No.	Number of pods harvested						Average
	1943	1944	1945	1946	1947	1948	
1	39	13	26	1	5	...	14
2	113	66	129	83	48	121	93
3	34	11	47	34	9	39	29
4	194	117	83	52	52	225	120
7	80	67	67	66	28	39	58
8	40	21	29	9	6	5	18
9	40	47	118	60	43	49	59
15	88	17	68	14	76	93	59
Total	628	359	567	31	267	571	

Appendix VIII

SODAPHOSPHATE LEVELS EXPERIMENT AT KIZIMBANI

RESULTS

Treatment	...	Dressings, cwt/acre
Po	...	Nil
P1	...	1½ Sodaphosphate
P2	...	3 Sodaphosphate
N1K1	...	1½ Sulphate of Ammonia + 1½ Sulphate of Potash
N2K2	...	3 Sulphate of Ammonia + 3 Sulphate of Potash

1st Crop—Maize—Masika Season

Results: lb/acre

	Po	P1	P2	Means
N1K1	1,412	1,676	1,776	1,624
N2K2	1,438	1,918	1,935	1,764
Means	1,430	1,797	1,855	

Significant Difference ($P=0.05$) between P treatment totals=195.5

Thus P1 and P2 are greater than Po

Other differences insignificant.

2nd Crop—Dwarf Sorghum—Mchoo Season (Manures reapplied)

Results: lb/acre

	Po	P1	P2	Means
N1K1	272.2	280.8	341.3	298.1
N2K2	276.5	328.3	388.8	331.2
Means	274.4	304.6	365.1	

Significant Difference ($P=0.05$) between P treatment totals=134.4

Thus P2 is greater than Po

Other differences insignificant.

Appendix IX

OIL PALM YIELDS AT KIZIMBANI

		1942	1943	1944	1945	1946	1947	1948
Number of palms		362	362	360	339	339	339	338
Number of bunches harvested		1,068	704	1,050	1,230	1,093	1,187	1,071
Average weight per bunch	lb.	15.8	21.9	30.5	29.3	25.3	32.7	30.0
Heaviest bunch	lb.	48	58	76	68	80	102	88
Average weight fruit per bunch	lb.	10.5	16.7	26.0	19.0	16.2	18.5	18.0
Average weight oil per bunch	lb.	1.01	1.24	2.10	1.80	1.45	1.76	1.76
Average weight oil per palm	lb.	...	...	6.4	6.2	4.69	6.19	5.58
Weight of oil per 100 lb. fruit	lb.	6.49	7.52	6.40	9.37	8.96	9.50	10.2
Weight of oil prepared	lb.	728	871	1,747	2,293	1,588	2,100	1,886

ANNUAL RECORD OF MILK YIELD
KIZIMBANI STATION

BREED: Zebu (Boran)

Year	Total No. of Cows in herd	Average output of milk per cow per annum lb.	No. of full time lactations	Lactation Records (lb)			Average daily yield during lactation in lb.
				Average milk yield in 305 days	Range in M. Y. Minimum Maximum	Average Lactation period, days	
1942	24	975	20	1,078	29 (31 days) 3,342 (359 days)	191	4.2
1943	28	792	21	851	3 2,232 (31 days) (329 days)	160	5.4
1944	25	1,341	18	1,112	2 3,153 (5 days) (410 days)	234	5.2
1945	29	1,531	20	1,637	6 4,043 (12 days) (313 days)	258	5.1
1946	47	1,289	36	1,339	6 3,984 (12 days) (297 days)	217	5.9
1947	41	1,637	33	1,682	23 2,976 (42 days) (306 days)	268	6.3
1948	46	1,722	42	1,862	6 4,058 (19 days) (295 days)	267	7.0

OTHER INFORMATION:

(1) Method of recording yields: Daily.

(2) Type of feeding: Grazing with concentrates (Started feeding concentrates from 12th July, 1944).

(3) No. of times milking and method of feeding: Milking three times a day in 1942 to September, 1943, and twice from October, 1943. Calves bucket fed (whole milk).

(4) Average age of heifers at 1st calving: 1,110 days (3 years and 15 days).

Appendix XI

APPROXIMATE PRODUCTION OF CLOVES IN FRASILAS OF
35 lb. FOR 35 CROP YEARS

(1st July to 30th June)

(Based on receipts of cloves at the Central Market and C.G.A.)

<i>Season</i>	<i>Zanzibar Frasilas</i>	<i>Pemba Frasilas</i>	<i>Total Frasilas</i>	<i>Mean crop per season in 5 year periods Frasilas</i>
1913/14	145,586	638,094	783,680	...
1914/15	194,920	351,389	526,309	...
1915/16	141,641	655,116	796,757	...
1916/17	208,716	302,919	511,635	...
1917/18	63,358	234,239	298,197	583,300
1918/19	259,273	565,229	824,502	591,500
1919/20	93,847	168,763	262,550	538,700
1920/21	231,831	316,446	548,277	489,000
1921/22	65,819	200,983	266,802	440,100
1922/23	291,417	690,498	981,915	576,800
1923/24	75,027	226,767	311,794	474,300
1924/25	240,952	520,490	761,442	574,000
1925/26	219,192	392,622	611,814	586,800
1926/27	203,843	529,186	733,029	680,000
1927/28	190,370	500,382	690,752	621,800
1928/29	74,828	125,740	200,568	599,500
1929/30	318,647	610,296	928,943	633,000
1930/31	51,796	201,320	253,116	561,300
1931/32	175,070	760,786	935,856	601,800
1932/33	242,772	244,594	487,366	561,200
1933/34	146,098	781,090	927,188	706,500
1934/35	360,037	503,415	863,452	693,400
1935/36	65,938	232,571	298,509	702,500
1936/37	45,096	351,568	396,664	594,600
1937/38	446,500	909,416	1,355,916	768,300
1938/39	39,879	115,211	155,090	612,000
1939/40	168,041	501,474	669,515	575,100
1940/41	146,323	575,277	721,600	655,700
1941/42	297,578	889,550	1,187,128	817,800
1942/43	40,049	223,691	263,740	599,400
1943/44	263,423	777,218	1,040,641	776,500
1944/45	200,417	459,396	659,813	774,600
1945/46	26,493	161,075	187,568	667,800
1946/47	170,280	924,329	1,094,609	649,200
1947/48	30,914	280,986	311,900	658,900
Average for 35 seasons	169,616	454,630	624,246	

Clove Production

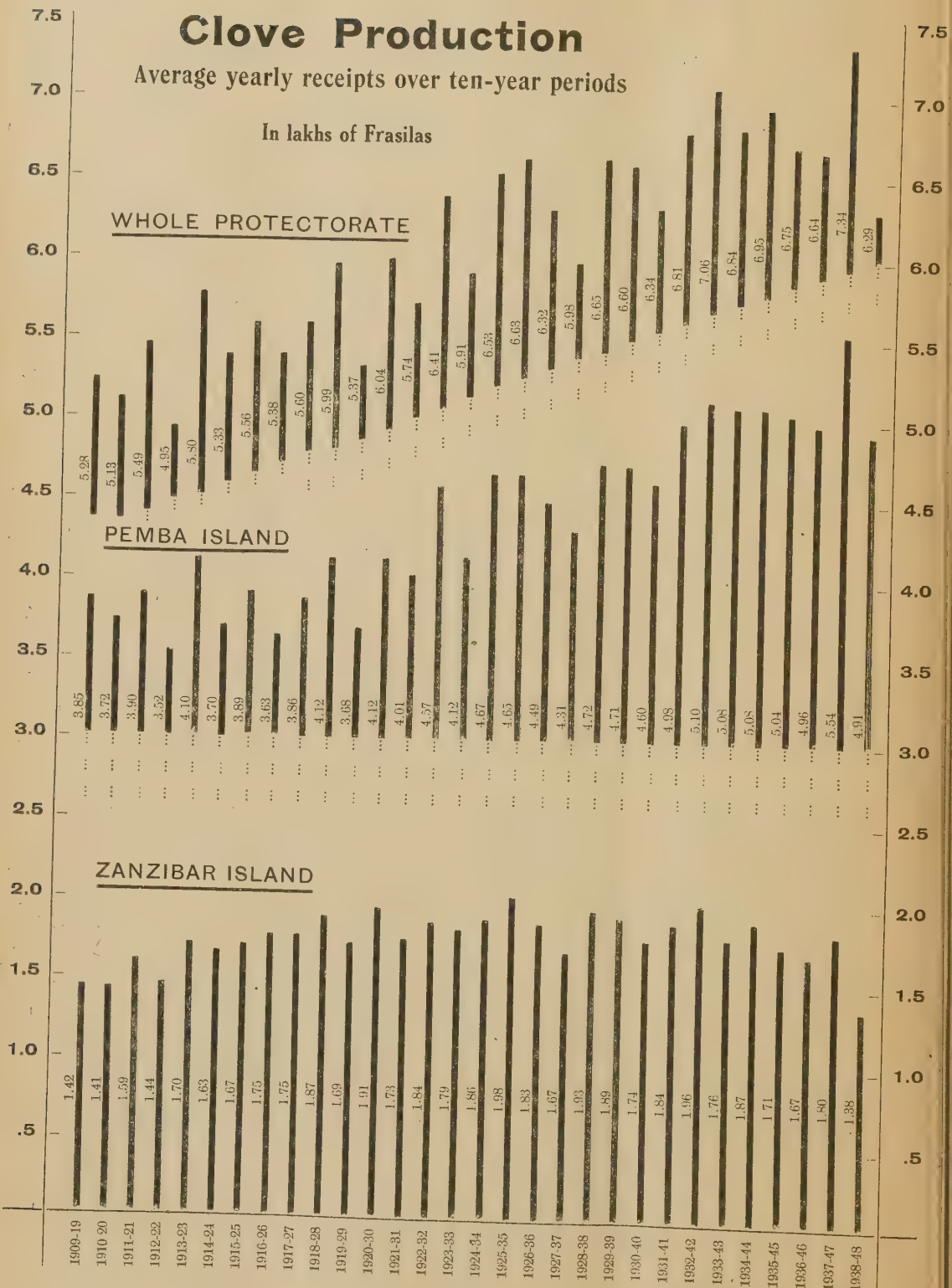
Average yearly receipts over ten-year periods

In lakhs of Frasilas

WHOLE PROTECTORATE

PEMBA ISLAND

ZANZIBAR ISLAND



1st Order Station. Non—Clove Growing Area.

SUMMARY OF METEOROLOGICAL OBSERVATIONS AT CHUKWANI PALACE, ZANZIBAR, 1948.

Lat.: 6° 15'S Long.: 39° 13'E Alt.: 61 feet. Standard Time 2h 45m East.

Month	Temperature				Relative Humidity		Extremes of Temperature of the Air				Rainfall			No. of Days Rain		
	Dry Bulb		Dew Point		h	h	Max.	Min.	Mean Max.	Mean Min.	½ Max. + Min.	Total			Maximum Fall in 24 hours	
	8.30	14.30	8.30	14.30								mm.	ins.			
January	F 81.1	F 87.5	F 75.8	F 75.9	% 84	% 69	F 93.8	F 73.0	F 89.5	F 75.6	F 82.5	F	61.5	2.42	ins. 1.84	6
February	81.8	88.0	76.4	77.2	84	70	95.8	74.9	90.9	75.9	83.4		107.2	4.22	1.65	13
March	81.6	86.8	77.2	78.5	86	77	93.9	74.0	90.3	76.9	83.6		153.7	6.05	1.46	15
April	78.9	82.8	76.8	76.9	93	82	89.6	73.0	85.2	76.0	80.6		356.4	14.03	2.05	23
May	78.6	82.8	76.0	75.3	92	78	88.0	72.0	84.9	75.6	80.3		274.1	10.79	3.66	20
June	76.4	81.6	72.6	72.4	88	74	85.8	70.5	82.7	74.1	78.4		100.8	3.97	1.72	12
July	75.0	80.4	71.5	70.5	89	72	85.6	70.0	81.9	72.7	77.3		48.8	1.92	0.57	8
August	75.0	80.4	71.1	70.3	88	71	85.3	69.0	81.8	71.4	76.6		78.5	3.09	1.20	15
September	76.6	83.2	71.7	70.3	85	65	92.3	69.0	84.9	71.3	78.1		10.7	0.42	0.20	4
October	79.4	84.5	74.4	75.0	85	73	92.6	69.9	87.2	73.4	80.3		91.4	3.60	1.06	14
November	81.3	85.0	76.6	77.3	86	78	92.2	72.8	87.5	74.3	80.9		181.4	7.14	2.12	17
December	80.4	84.9	76.2	77.4	87	78	92.9	71.6	87.5	75.2	81.3		302.3	11.90	2.55	17
Year	78.8	84.0	74.7	74.7	87	74	96.8	69.0	86.2	74.4	80.3		1766.8	69.55	3.66	164

2nd Order Station.

Non-Clove Growing Area.

SUMMARY OF METEOROLOGICAL OBSERVATIONS AT VICTORIA GARDENS, ZANZIBAR, 1948.

Lat.: 6° 10'S Long.: 39° 11'E Alt.: 18 feet. Standard Time 2h 45m East.

Month	Temperature				Relative Humidity		Extremes of Temperature of the Air				Rainfall			No. of Days									
	Dry Bulb		Dew Point		h	h	Max.	Min.	Mean		Max.	Total			Maximum Fall in 24 hours								
	8.30	14.30	8.30	14.30					Max.	Min.		mm.	ins.										
January	F	81.2	F	75.3	%	82	67	F	92.8	F	72.8	F	89.3	F	76.6	F	82.9	F	61.5	2.42	1.72	20	
February	...	81.6	...	75.7	...	82	69	...	92.4	...	73.0	...	89.5	...	75.8	...	82.7	...	90.7	3.57	1.70	18	
March	...	82.3	...	77.3	...	84	73	...	91.6	...	74.4	...	89.3	...	76.4	...	82.9	...	111.5	4.39	1.93	2	
April	...	79.1	...	76.6	...	90	82	...	88.7	...	73.2	...	84.9	...	75.7	...	80.2	...	369.3	14.54	2.89	28	
May	...	78.9	...	75.3	...	89	77	...	89.6	...	72.3	...	85.4	...	75.9	...	80.7	...	320.5	12.62	3.51	17	
June	...	76.7	...	72.5	...	87	74	...	86.2	...	70.6	...	83.2	...	73.8	...	78.5	...	95.8	3.77	1.10	13	
July	...	75.2	...	71.1	...	87	71	...	85.4	...	68.8	...	82.8	...	71.9	...	77.3	...	52.8	2.08	0.55	7	
August	...	75.3	...	71.4	...	88	71	...	85.0	...	67.8	...	82.8	...	70.8	...	76.8	...	82.3	3.24	1.15	24	
September	...	76.7	...	71.8	...	85	67	...	88.9	...	67.7	...	85.1	...	70.5	...	77.8	...	16.0	0.63	0.25	9	
October	...	78.8	...	74.1	...	89	74	...	88.5	...	68.5	...	85.6	...	72.5	...	79.1	...	171.2	6.74	2.27	17	
November	...	81.2	...	76.0	...	83	76	...	89.6	...	71.7	...	86.5	...	73.6	...	80.1	...	214.4	8.44	2.09	9	
December	...	80.6	...	75.7	...	85	76	...	92.0	...	71.8	...	87.3	...	75.1	...	81.2	...	344.7	13.57	4.92	11	
Year	...	79.0	...	74.3	...	85	73	...	93.6	...	67.7	...	86.0	...	74.1	...	80.0	...	1930.7	76.01	4.92	Dec. 11	173

Dec. 11

Temperature Station.

Clove Growing Area.

SUMMARY OF METEOROLOGICAL OBSERVATIONS AT WETE, PEMBA 1948.

Lat. : 5°04'S Long. : 39° 43'E Alt. : 60 feet. Standard Time 2h 45m East.

Month	Temperature				Relative Humidity		Extremes of Temperature of the Air				Rainfall			No. of Days		
	Dry Bulb		Dew Point		h	h	Max.	Min.	Mean Max.	Mean Min.	½ Max. + Min.	Total			Maximum Fall in 24 hours	
	8.30	14.30	8.30	14.30								mm	ins.			
					F	F	F	F	F	F	ins.			Date		
January	80.9		75.0		%		88.4	71.8	86.3	74.9	80.6	26.9	1.06	0.94	21	3
February	82.7		75.5		83		90.5	71.0	88.3	74.4	81.3	80.8	3.18	1.25	19	9
March	83.6		77.1		79		90.5	71.9	88.6	75.1	81.9	184.9	7.28	3.24	22	7
April	81.7		76.9		81		89.9	71.1	85.7	73.7	79.7	526.5	20.73	4.59	26	23
May	79.9		75.7		85		89.7	70.0	85.0	73.3	79.1	440.4	17.31	2.48	2	25
June	78.5		73.0		87		86.0	66.9	83.1	70.6	76.9	215.4	8.48	1.04	23	23
July	76.4		71.6		83		84.0	67.0	82.3	68.7	75.5	121.2	4.77	1.40	1	19
August	76.5		71.1		85		83.9	66.5	82.3	68.9	75.6	62.2	2.45	0.39	20	14
September	78.3		72.2		83		86.5	66.6	83.6	69.2	76.4	26.4	1.94	0.27	17	7
October	79.8		74.0		82		88.0	67.2	84.9	71.8	78.3	194.3	7.65	2.37	26	16
November	82.1		75.6		83		88.4	70.0	86.3	72.9	79.6	200.9	7.91	3.04	10	14
December	80.5		75.7		81		89.3	70.0	86.0	73.8	79.9	308.1	12.13	4.83	29	21
Year ...	80.1		74.5		86		90.5	66.5	85.2	72.3	78.7	2388.0	94.02	4.83	Dec. 29	181

RAINFALL STATIONS, 1948

	Jan.	Feb.	March	April	May	June	July	August	Sept.	October	Nov.	Dec.	Total 1948	Total 1947
Clove Growing Areas :														
Dole	Rain ...	3.44	4.80	6.66	23.67	13.09	5.91	1.44	2.39	2.23	5.16	4.54	81.03	69.61
	Wet Days ...	7	10	14	26	19	11	5	12	14	16	15	161	141
Selem	Rain ...	3.11	3.42	5.63	19.11	9.66	4.38	1.95	2.18	1.73	6.51	7.11	73.86	65.31
	Wet Days ...	5	8	15	28	20	14	9	16	12	20	18	183	169
Mkokotoni	Rain ...	4.44	2.65	0.87	16.76	13.53	3.96	7.59	1.24	1.00	1.23	4.80	65.27	60.73
	Wet Days ...	2	5	5	19	13	11	10	7	3	4	5	96	96
Mkwajuni	Rain ...	3.27	2.46	2.89	15.89	13.62	4.62	4.19	1.88	0.88	2.25	5.62	69.32	61.19
	Wet Days ...	3	7	11	24	20	12	11	16	9	10	10	147	148
Mwera	Rain ...	2.72	3.31	5.33	17.44	10.13	5.24	2.47	1.16	0.95	3.85	6.03	68.66	69.98
	Wet Days ...	2	5	10	24	17	8	10	17	14	13	17	151	123
Kigomasha	Rain ...	2.57	0.37	3.60	19.00	19.17	8.08	4.86	4.49	2.10	7.30	6.23	97.03	73.94
	Wet Days ...	2	3	10	23	23	23	18	18	7	12	12	169	151
Matangitwani	Rain ...	3.74	2.06	3.60	21.37	22.34	8.56	5.90	3.17	1.97	5.90	9.44	99.37	87.73
	Wet Days ...	4	4	15	24	29	25	24	19	12	19	12	205	192
Mkoani	Rain ...	4.72	1.97	4.87	28.85	16.54	10.53	2.85	1.83	0.67	3.41	6.69	102.73	112.40
	Wet Days ...	4	6	10	26	27	23	20	16	7	11	16	183	150
Mtambile	Rain ...	3.14	4.27	5.99	24.16	17.49	7.95	1.62	1.54	1.06	5.02	8.15	98.73	119.56
	Wet Days ...	9	7	14	21	24	22	13	12	7	15	10	169	167
Limbani	Rain ...	2.19	1.77	5.46	24.57	18.92	8.33	3.51	2.37	0.68	8.23	11.03	100.47	117.95
	Wet Days ...	4	10	10	25	25	23	17	18	5	16	13	187	150
Wesha	Rain ...	1.82	1.78	3.72	22.24	19.73	9.28	2.84	3.80	0.80	3.30	5.09	88.39	99.85
	Wet Days ...	3	6	9	28	27	21	17	13	5	16	10	174	174
Non-Clove Growing Areas :														
Chwaka	Rain ...	2.00	3.46	2.90	26.86	10.35	5.89	3.88	2.22	0.47	2.88	2.92	74.30	63.23
	Wet Days ...	3	8	9	26	22	12	12	7	2	6	5	126	138
Hanyegwa Mchana	Rain ...	...	...	...	...	...	3.12	3.42	2.95	1.73	1.90	4.81	31.03	...
	Wet Days ...	...	...	...	...	...	13	9	15	6	10	12	80	...
Muongoi	Rain ...	...	...	...	...	...	...	...	...	0.87	1.72	1.96	18.68	...
	Wet Days ...	...	...	...	...	...	...	...	...	2	6	7	30	...
Makunduchi	Rain ...	3.84	3.00	3.86	25.56	9.27	4.63	2.35	2.60	0.35	2.90	0.56	69.47	80.41
	Wet Days ...	9	9	12	26	20	10	9	9	2	7	1	125	113

Note:—Rainfall in inches. Records for Hanyegwa Mchana and Muongoi for part of the year only.

